ECONOMIC COSTS OF SEEKING MALARIA CARE TO HOUSEHOLDS IN THE KASSENA-NANKANA DISTRICT OF NORTHERN GHANA

By:

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A dissertation submitted to the faculty of Social Science and Humanities of the University of Cape Town, in partial fulfillment of the requirements for the Masters degree in Health Economics.

August, 2000

DECLARATION

While acknowledging information from other sources, I do hereby declare that, this research paper is my own original work and has not been submitted for any academic and/or examination purposes at any University.

Signed by candidate

JAMES AKAZILI

This research paper has been submitted for examination with my approval as the University Supervisor

MS VELOSHNEE GOVENDER

DEDICATION

With Great love and appreciation, I dedicate this work first and famous to the Almighty God for the very life and sustenance and secondly to my parents Mr. and Mrs. Abiiro for their great care and affection in the face of overwhelming odds.

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ABBREVIATIONS

BCG	Bacille Culmette Gurine (Vaccine against Tuberculosis)
DECs	Data Entry Clerks
DHMT	District Health Management Team
DPT	Diphtheria Pertusis Tetanus (Vaccine)
DRC	Democratic Republic of Congo
EPI	Expanded Programme on Immunisation
GDP	Gross Domestic Product
GHAT	Ghana Health Assessment Team
GMTHP	Ghana Medium Term Health Plan
ITN	Intersecticide Treated Nets
IW	Intestinal Worms
MCL	Marginal Cost of Labour
MoH	Ministry of Health
MPL	Marginal Product of Labour
NHRC	Navrongo Health Research Centre
NGO	Non Government Organisation
RHMT	Regional Health Management Team
POL	Poliomyelitis
PRC	Pregnancy Related Cases
SD	Skin Diseases
TDR	Research in Tropical Diseases
URI	Upper Respiratory Infections
USAID	United States Agency for International Development
WHO	World Health Organisation
WTP	Willingness to Pay

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ACKNOWLEDGEMENT

The Masters Programme and dissertation was financially supported by UNDP/World Bank/WHO Special Programme for Research and Training in Tropical diseases.

Ms Veloshnee Govender, a Lecturer/Researcher at the Health Economics Unit of the Community Health School, University of Cape Town, had the patience and understanding to guide me, offer constructive criticisms and useful suggestions which made this study possible, to her, I am greatly indebted.

To Associate Professor Di McIntyre, Director of the Health Economics Unit of the Community Health School, University of Cape Town, I acknowledge and appreciate her immense contribution to making this document valuable.

I thank Ms Edina Sinanovic, Ms Charlotte Muheki, Mr. Njoumemi Zakariaou, Mr. Eyob Zere Asbu, Mr. Steve Thomas, Mr. Neil Ernstzen and all staff of the Health Economics Unit for their technical support in the development of the proposal and the final realisation of this study.

I wish to acknowledge and appreciate the technical and logistic support of my home institution, the Navrongo Health Research Centre (NHRC).

My warmest thanks go to the chiefs and people of the Kassena-Nankana district for their contributions to making the study possible.

I am very grateful to Dr. Nazzar, Director of NHRC, Dr. Cornelius Debpuur, Dr. Moses Aikins, Dr. Pierre Ngom, Mr. Philip Adongo, Ms Patricia Akweongo, Ms Shelly Trim, Mr. Martin Adjuik and all the Technical staff of the Centre for their indispensable contribution to making this study possible.

My most sincere gratitude goes to Dr. Fred Binka and Dr. Jose Kirigia, who together ensured that I got the opportunity to pursue the Masters programme.

I wish to thank the staff of the Accra office of NHRC, Mr. Titus Tei, Mrs. Margaret Bugase for their support in all my travel arrangements and correspondence with my sponsors.

My thanks go to Mr. Felix Kondayire, Ms Elizabeth Awine, the Data Clerks, the computer Centre, the field assistants who collected the data, the accounts office, the administration and all who contributed to making this work a success.

My regards also go to Mr. Thomas Anyorigiya, Ms Gifty Akum and Ms Helen Ayeridine for their encouragement and moral support throughout the programme

To my classmates Ms Besinati Phiri, Mr. Francis Mangani, Mr. Urbanus Kioko Muthuku and Rev. Fr. Hyacinth Ichoku, I am grateful for the technical support and fruitful time we spent together, God bless you all.

For the moral support, daily prayers and well wishes, I say a big thank you to my family.

To the Almighty and merciful God, I am most grateful for your continuous guidance, protection and immense blessings throughout my academic career.

ABSTRACT

Although, malaria is a major problem in Ghana, as in many Sub-Saharan Africa countries, there has been little research on its economic impact, particularly at the household level. National statistics only show that malaria accounted for more deaths, more cases and more potential days of life lost than other cause, however little was said about the costs to households. The aim of the study was to estimate the economic costs (direct and indirect) of seeking malaria care to households and in doing this, the study used data collected from a randomly sampled 423 households in K-N district. Malaria was ascertained not by parasitological test but through self-reporting based on symptoms described by respondents using a one-month recall period.

The estimation of direct cost involved the out-of-pocket expenditure on special foods, drugs, transportation, diagnostic and consultation and all other related costs (e.g. inpatient cost, toiletry cost, etc.). Indirect cost was estimated based on the number of days forgone and waiting time incurred due to malaria episode or caretaking and daily wage rate.

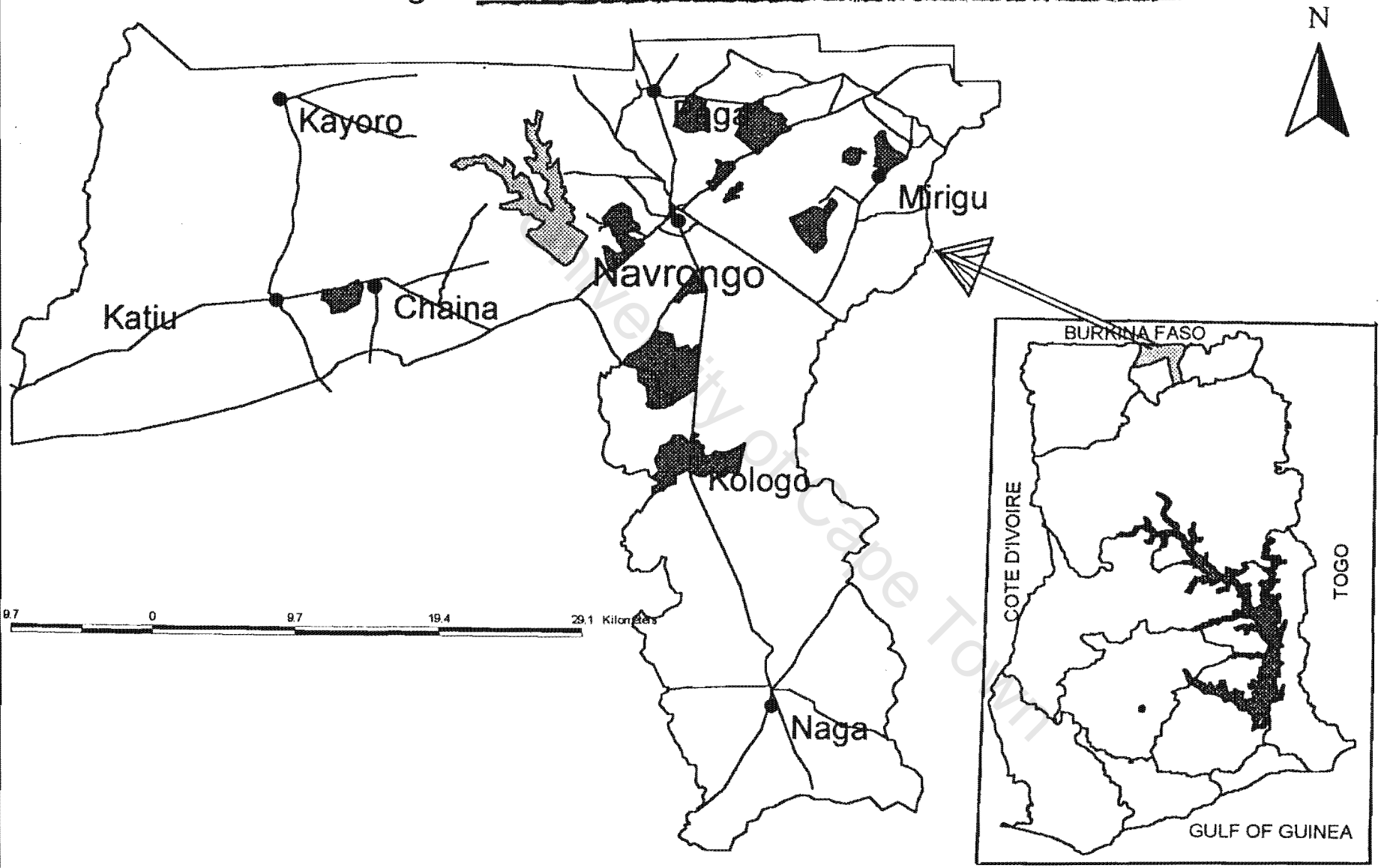
The estimated costs were divided between direct and indirect costs, and examined in terms of location and case severity. Total direct cost per case in urban area was ¢6,701 ($1.79) compared to ¢7,822 ($2.09) in rural area. With regards to severity, direct cost per severe malaria was ¢11,182 ($2.98) compared to ¢5,317 ($1.42) of mild malaria. In the case of indirect cost and with regards to days lost, the average duration of severe malaria was 5.3 days, which was significantly higher when compared to 2.3 days of mild malaria. Estimated indirect cost per case in urban area was ¢20,804 ($5.55) compared to ¢15,842 ($4.22) in rural area. In terms of severity, 55% of the days lost were due to severe malaria and women in general lost more days and often incurred higher losses in potential

earnings than men. Indirect cost per case was ¢31,843 ($8.52) compared to ¢10,822 ($2.89) of mild malaria. Combining direct and indirect costs, we obtained a total cost in terms of severity as ¢14,728,740 ($3,927.67), which yielded a cost per case and per household as ¢23,949 ($6.39) and ¢34,820 ($9.29) respectively. These results are not too different in term of location. In both situations, indirect cost was 71% percent of the total cost of malaria care. The total cost translated into 8.7 days of female output or 7.7 days of male output. These days lost result in enormous income forgone to households. Moreover low-income households carried a disproportionate share of the economic burden of malaria. The study found that malaria accounted for 34.1% of poor households' annual expenditure and only 1% in the case of rich households.

Based on the results, several recommendations that could reduce the cost of malaria to households are made. These include the formation of malaria volunteers to help identify and refer malaria cases for early treatment. Public education is also necessary to ensure that households seek early treatment and to also encourage increased used of preventive measures notably the Insecticide treated bed nets (ITNs). Households especially women should be economically empowered (e.g. sheanut extraction, dressmaking, etc.) so that financial barriers to health care are reduced.

The study identifies several areas for further research. These include a one-year study on economic cost of parasitologically diagnosed malaria. Also a similar study could examine the institutional cost of malaria episode in the district. An investigation on the factors influencing the demand for malaria care would also help to explain the health-seeking behaviour of malaria patients and caretakers.

Fig.1: **Map of Kassena-Nankana District**



Chapter One

INTRODUCTION

"Malaria traps the people of Africa in poverty, stops adults from earning a living and children from going to school; each year families spend the equivalent of several months earnings on malaria treatment and prevention, it does not have to be like this, more efforts need to be pursued to combat it……" (Nigerian President Olusegun Obasango on the First Africa Malaria Summit on 25th April 2000 in Nigeria)[1].

1 Introduction

This introductory chapter begins with an overview of the study. The chapter also defines the research problem, highlights the aim and objectives of the study, as well as the justification of the study. The chapter concludes with the organisation of the remaining chapters.

1.1 Overview

Malaria[2] remains the most important vector-transmitted human disease (Evans *et al.* 1997). About 40% of the world's population (i.e. over 2 billion people) live in malaria endemic areas and are at risk of infection (WHO 1993; Foster 1994). In Africa, malaria remains one of the most serious public health problems and in Sub- Saharan Africa; it contributes considerably to morbidity and mortality (Ghana-MoH 1991). Malaria was thought to be declining, but has increased dramatically over the last decade, and 90% of reported cases are in Africa (African Malaria Vaccine Testing Network 1998). Nearly 1.5

[1] Available at htt://www.mg.co.za/mg/news/2000/apr2/25apr-malaria.html

[2] The term malaria designates the diseases produced by the infection with any of the four human parasites of the genus *Plasmodium* (*P. falciparum, P. vivax, P. malariae and P. ovale*) (Najera and Hempel 1996). These parasites are mostly transmitted from man to man by the bite of the female mosquito of the genus *Anopheles* (Ibid.). The symptoms of the disease are variable and include irregular fever, malaise, headaches, muscular pains, sweats, chills, nausea, vomiting and some diarrhoea among others (Ibid.).

to 2.7 million people die from malaria every year in Africa. Malaria is a primary cause of poverty in Africa and the human suffering and economic burden has reached unacceptable levels (WHO/AFRO 1997).

In parts of Africa, malaria is responsible for 10% of hospital admissions and 20-30% of outpatient consultations, imposing direct costs on both governments and patients (WHO 1993). Households incur additional costs to treat episodes outside the formal health system, which can be a substantial proportion of households' income. Moreover illness reduces the time they spend in productive pursuits (Ettling and Shepard 1991; Shepard *et al.* 1991).

In Ghana, malaria is said to be the major cause of mortality in young children (Binka *et al.* 1995). It accounted for 23% of child deaths in 1991-1992 in the Kassena-Nankana district in northern Ghana (*Ibid.*), which is the district being focused on in this study. Transmission of malaria occurs all year round, but in northern Ghana, transmission is highest between June and October, which coincides with the farming season (Ghana MoH 1992; Binka *et al.* 1994).

The Ghana Health Assessment Team (1981)[3] considered malaria to be the highest cause of loss of number of days in healthy and productive life in Ghana. It has been strongly advocated that research on all aspects of malaria should be vigorously pursued and the results translated into programs for malaria management and control.

[3] A team that investigated the health issues, which were part of measures for the reformation of the health sector in the country.

1.2 The research problem

Apart from health institutional costs, a malaria episode has direct financial consequences for the household involved, because of expenditure on medical consultation, diagnosis, treatment, travel, and special diet for the malaria patient (Konradsen *et al.* 1997). A high percentage of household income may be spent on malaria treatment. In addition, indirect costs need to be considered because adults may not be able to work and children unable to go to school.

Thus, to better understand the burden of malaria to households in a malaria endemic area like Ghana, it is necessary to estimate the value of all the costs (user fees, transport cost, special food and time lost) associated with seeking health care for malaria. It is also important to quantify the opportunity cost of the time involved in seeking health care which is defined as the "value of the output foregone for not using the time in its next best alternative" (Konradsen *et al.* 1997). Hence, the opportunity cost to a trader or a farmer for seeking care at a health facility is the trade or the farm output forgone for not trading or working on the farm during the period which he/she was at the health facility. The value of lost time to production as a result of the malaria is therefore an economic cost to the households.

The Ghana Ministry of Health's Malaria Action Plan for 1993 -1997 indicated that there is no reliable information on the impact of malaria on labour productivity and the economy as a whole. Strategies for malaria management and control should be economically evaluated to ascertain the economic cost of malaria to households in the country.

This study intends to contribute to filling this important gap by assessing the economic cost of malaria in a malaria endemic, and one of the most economically deprived areas of northern Ghana, namely the Kassena-Nankana (K-N) district.

1.3 Aim and objectives of the study

1.3.1 Aim

The aim of the study is to understand and identify the cost borne by patients and their families in order to estimate the economic cost of seeking malaria care to households in the K-N district.

1.3.2 Objectives

1. To identify and estimate the direct and indirect costs to households of seeking care for malaria.
2. To determine the proportion of households' income spent on seeking care for malaria.
3. To determine the average cost per malaria episode to households.
4. To provide recommendations on improving existing policy for malaria management and control in the K-N district.

1.4 Justification of study

Increasingly households are called upon to participate in bearing the costs of not only preventive but also curative health care (Anonymous 1988). It is imperative that we have a better understanding of their health-associated expenditure. Since malaria is one of the most important causes of morbidity in tropical zones (Coosemans and Barntwanaugo

1989; Fermer *et al.* 1989; Juliez 1990; Mouchet *et al.* 1991), it is also important to understand its impact on households.

Although, malaria is a major health problem in Ghana, as in many Sub-Saharan Africa countries, there has been little research on its economic impact, particularly that at a household level. National statistics only show that malaria accounted for more deaths, more cases and more potential days of life lost than any other disease. A study on the economic costs of malaria can help planners evaluate research and control measures for malaria in relation to other development projects.

The current intervention strategies used in the K-N district and the country as a whole are case management and personal protection, using treated bednets. The economic evaluation of treated bednets has been undertaken in recent trials (Binka *et al.* 1997), but an investigation on the economic burden of malaria is yet to be conducted. Therefore, the proposed study would underscore the economic cost of malaria and potentially influence decisions on the management and control of the disease. With the current promotion of bednet use in the district, the findings of the study could be used in advocacy activities with the community to further encourage the use of insecticide treated bednets (ITNs). By reducing the incidence and prevalence of malaria (Chavasse *et al.* 1997), ITNs will indirectly reduce the costs of malaria care to communities, households and individuals.

Knowledge about the direct and the indirect costs of treating malaria may influence the health-care seeking behaviour of people and provide the needed impetus for malaria

control. It is important therefore to document these costs to help people make informed choices about treatment and preventive cost alternatives of malaria, and also for decision-makers to use the results as inputs in formulating an appropriate and effective health-care policy.

The cost associated with time lost from work, transportation to seek care, and premature deaths, as well as fees paid in cash and kind on seeking malaria treatment are significant costs to households in Ghana. However, before something can be done to alleviate the plight of the poor and vulnerable so that access to malaria care can be enhanced in Ghana, it is important to have an idea of the total costs of seeking malaria care to households.

This study would therefore provide valuable empirical information to the Ministry of Health, through the District Health Management Teams (DHMTs) about the economic burden of malaria on households (e.g. the proportion of household incomes spent on malaria treatment). This will serve as the basis for improving existing policies to improve decision-making processes on this major health problem.

Andreano and Helminiak (1988) have hinted that despite the many studies on the subject, we remain woefully ignorant of the social and economic effect of malaria in those countries of the world where it is prevalent. They also emphasised that findings in many of these studies in the local settings cannot be easily generalised from one area to another. Najera and Hempel (1996) also recognised that the evaluation of the impact of malaria to

the community, households or individuals may make sense only for a particular local situation and that simple extrapolation will often be very misleading. This calls for more extensive research in this relatively new and long-neglected area of malaria in Africa.

1.5 Organisation of the remaining chapters

Chapter Two examines the background of the country. A brief description of the geography, economic, social, demographic and health issues of Ghana are highlighted. Chapter Three is a literature review of the economic cost of malaria, focusing on the global situation, and that of Ghana, specifically with regard to the study area. Chapter Four describes the conceptual framework applied in the study. Chapter five outlines the methodology of the study. The chapter also discusses the study limitations and ethical issues. In chapter six, the results of the study are presented. This includes both the descriptive statistics and the estimation of economic costs associated with episodes of malaria. Chapter Seven analyses the results presented in the previous chapter. It evaluates the extent to which the study objectives have been met. In chapter eight, the summary, conclusions and policy recommendations are made, based on the findings of the study. The chapter concludes with suggestions for future research.

BACKGROUND INFORMATION ON GHANA

2 Introduction

This chapter captures the general background of Ghana. It briefly explains the geography, economic, political, demographic, and more importantly the health background of the country. The chapter concludes with an examination of malaria in the study district.

2.1 Geography

Ghana is located on the West Coast of Africa, about 750km north of the equator on the Gulf of Guinea, between the latitudes of 4 -11.5 north. The country has a total land area of 238,305km^2 and is bounded on the north by Burkina Faso, on the west by Cote d'Ivoire and on the east by Togo.

In the north, where the study was undertaken, the predominant vegetation is savanna and shrub, while the south has an extensive rain forest. Ghana has a tropical climate, characterised most of the year by moderate temperatures [generally 21-32 ° C (70-90 ° F)], constant breezes and sunshine. Annual rainfall in the south averages 2,030 mm, but varies greatly throughout the country, with the heaviest rainfall in the western region and the lowest in the north. These conditions produce a favourable climate for all types of mosquitoes, resulting in the widespread occurrence of malaria in the whole country.

2.2 The Socio-Economic profile of Ghana

2.2.1 Economic indicators

Table 1 describes some key economic indicators of Ghana from 1976 to 1997.

Table. 1: Key Economic Indicators for Ghana

INDICATORS	1976	1986	1996	1997
GDP(US $billions)	2.8	5.5	6.3	6.8
Total Debt/GDP(%)	25.7	47.9	96.8	93.9
Total Debt service/debt	5.8	28.5	27.1	33.7
Present Value of Debt/GDP	-	-	58.5	55.3
Current a/c balance/GDP	-3.8	-3.6	-8.3	-6.4
Export of goods and service/GDP	15.7	16.6	27.2	24.8
Import of goods and services	16.0	20.1	37.6	33.5
Agriculture (% of GDP)	50.6	47.8	44.4	47.4
Industry (% of GDP)	19.2	17.2	16.6	16.6
Manufacturing (% of GDP)	13.1	11.1	9.4	9.5
Services (% of GDP)	30.2	35.1	38.9	36.0

Source: http://www.worldbank.org
-Data not available

The country is characterised as a low-income country. The gross domestic product (GDP) was only US$6.8 billion in 1997, of which total debt was 93.9% in 1997 GDP (see Table 1). The country had a negative trade balance, as total imports far-exceeded total exports in 1996 and 1997. The agricultural sector dominates the economy of Ghana and had a share of 47.4% of GDP in 1997 with a growth rate of 2.2%. The sector is characterised by small-scale peasant farming, which absorbs about 60% of the total adult labour force. The service sector is the second largest contributor (36%) to GDP after agriculture and it is dominated by petty-traders, artisans and technicians. In general, the growth of the economy has been poor (less than 4% in 1997) and this had a negative effect on the share of resources allocated to the health sector, which has not increased over the years.

2.2.2 Income Distribution

The estimated *Gini* coefficient[4] for Ghana of 40%, has remained relatively stable between 1985 and 1992, and is slightly lower than that for most other African countries (World Bank 1994). The top quintile of earners receive 44.1% of the total income compared to 7% for the bottom quintile, which leads to the unacceptable ratio of highest to lowest of 6.3%. This fairly skewed income distribution impacts on the ability of the poorer groups to access health services, for which they have to pay. Seeking malaria care, which has been a common disease in the area, has profound negative effects on household incomes, especially poorer households.

2.2.3 Poverty

Recent work indicates that 30.1% of Ghanaians are below the poverty line (World Bank 1994), which is higher in comparison to other developing countries (25%). All regions and socio-economic groups are affected and the worst affected areas are the savanna and the rural forest areas. The least affected socio-economic groups are those in formal sector wage employment (especially those in the private sector). The resources in Ghana are seriously over stretched and this has serious implications on health and nutritional conditions, especially for women and children. The incidence of poverty is particularly skewed towards the Upper East Region where the study was conducted. The region relies on perennial food supply to supplement the poor production in the region. Participatory poverty analysis confirmed inferior living amongst the poorest decile of the population,

[4] One of the measures of income distribution of a country is the Gini coefficient (0 = perfect equality; 100 = perfect inequality).

especially in the Upper East Region (World Bank 1994), and here the incidence of poverty has affected the general access and ability of people to pay for health services.

2.3 Demographic and health situation

The population of Ghana in 1999 was estimated to be 18.7 million (with 45% under the age of 15 years)[5] With a growth rate 3.0%, Ghana's population is expected to reach 20 million in 2000. The population growth rate of 3.0% is higher than the average for Sub-Saharan Africa, and this seriously undermines attempts for growth and development as well as the health and survival of Ghanaians.

The high population growth increases the demand for health care, which in turn places constraints on existing facilities and infrastructure, which relates to excreta disposal systems, drainage, clean water, food and housing. Further, the overcrowding and poor sanitary conditions provide favourable grounds for the breeding of mosquitoes in Ghana (GMTHS 1995). In parts of Ghana, including the Upper East Region where the study was conducted, the average occupancy rate is 4.4 (probably underestimated) per room, and illnesses such as malaria and tuberculosis are particularly exacerbated by rapidly increasing population (*Ibid.*).

2.4 Health facilities and health in Ghana

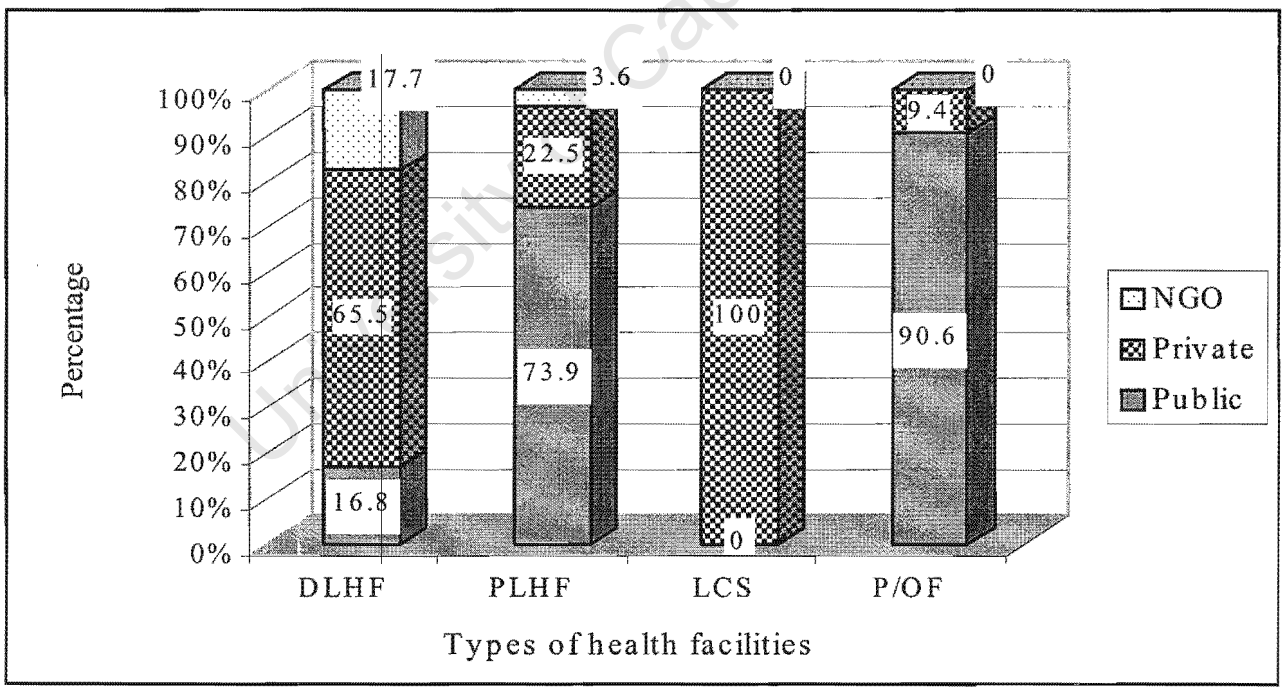
2.4.1 Health facilities

Figure 2 shows the distribution of the various types of health facilities in Ghana. Apart

[5] Available at *http://www.worldbank.org*

from hospitals, the private sector has a substantial share of the health facilities. At the district levels, 65.5% of the facilities are privately owned compared to 17.7% and 16.8% being public and NGOs facilities respectively (see Figure 2). The private sector is quite significant in the country. It owns a 100% of the licensed chemical sellers and has a significant share of 65.5% and 22.5% of the district and primary level facilities respectively (see Figure 2). The presence of the private sector in the health delivery follows from the overall government policy on privatisation. However, the high cost of health often associated with the sector means many people, especially the poor may not be able to access adequate health-care.

Figure 2: Types of Health Facilities in Ghana



Source: World Bank (1994)
DLHF: District level health facilities, PLHF: Primary level health facilities.
LCS: Licensed chemical shops, P/OF: Pharmacy and outlets facilities.

In 1993, the total number of health sector beds in Ghana's 71 public hospitals was 13,400, resulting in an average hospital size of 188 beds (Ghana MoH 1994). The total number of beds in the 41 NGOs hospitals was 4,900, with an average NGO hospital size of 119 beds. The total non-private bed number in the country is 18,300.

The total population bed ratio of 819:1 is comparable with that of Africa as a whole, which has a ratio of 900:1(World Bank 1994). However, quite disturbing is the high percentage of regional variation. The Upper East Region (UER) is comparatively under-resourced in terms of health facilities, with a bed ratio of 2,218:1 in comparison to the capital Accra, which has 552:1. This limits people access in the UER to public health service and often results in them seeking health-care from drug shops, drug peddlers and even purchasing drugs without prescriptions. These various treatment alternatives which often involves the provision of health care by poorly trained providers, contribute to the problem of drug resistance, leading to the high cost of health care in the region (Ghana MoH 1994).

2.4.2 Health personnel

Shortly after independence, Ghana's health personnel figures were comparable to both developed and developing countries (Florld 1991). A rapidly growing Ghanaian population has placed a severe constraint on personnel capacity to effectively render adequate and sustainable health services. The situation has been worsened by emigration of Ghanaian health professionals to other countries in search of better salaries. The

physician emigration is quite disturbing, considering the World Bank (1994) estimated that the societal cost of one emigrating physician could be as high as US$30,000.

Table 2 indicates the distribution of health personnel between sectors and locations (Hassan 1996).

Table 2: Distribution of Health Personnel (by sector and location)

Health facilities	Sector			location		Total
	Public	Private	NGO	Urban	Rural	
Doctors	611 (61.6%)	300 (30.3%)	80 (8.1%)	800 (80.7%)	191 (19.3%)	991 (100%)
Nurses	10,000 (52.6%)	8,000 (42.1%)	1,000 (5.3%)			19,000 (100%)
PHC personnel	7,000					7,000
Paramedics						350
Technicians						1,200
Midwives		282				282

Source: World Bank (1994)

The public sector accounts for 61.6% and 52.6% of physicians and nurses respectively, but continue to loose them to the private sector, which accounts for 30.3% and 42.1% of physicians and nurses respectively. As noted earlier the cost of health-care associated with the private providers is substantial and many people are not able to access health-care from them. Moreover most of these private providers are located in the urban areas, which is often not easily accessible to the rural dwellers. The NGO sector is quite small in Ghana and accounts for less than 10% of total physicians and nurses.

In terms of location, the majority of physicians work in the urban area (see Table 2). More than 50% of all the physicians are located in the capital city Accra, where less than 10% of the population live. The ratio of physicians to the population in the rural areas is as low as 1: 54,000 compared to 1: 3,500 in Accra. This often results in long waiting

times at health facilities. In such situations, many often resort to self-treatment or seeking care from drug peddlers. The implications of this have been discussed in the previous sections.

2.4.3 Health service coverage and service utilisation

With regard to the overall access and utilization of health care services, the health sector is beset with problems. This is reflected in the low coverage, utilization and access figures (see Table 3).

Table 3: Health services coverage

	Access (%)			BCG %	DPT %	POL3 %	Measles %
	Rural	Urban	Total				
Ghana (1993)	**35**	**93**	**52**	**81**	**57**	**57**	**51**
Togo(1988-1990)	20	60	30	79	61	61	51
Sub S. Africa`1993	54	71	56	77	57	57	57
More dev. ctries '90	-	-	100	82	83	85	82

Source: World Bank (1994)
- Data not available

Access[6] is only 52%, which is marginally lower than the average for Africa of 56% (World Bank 1994). Urban access of 93% is quite impressive, but particularly dismal is the staggering low rural access at 35%, considering that more than 60% of the population live in the rural areas. The low utilization may be due to the promulgation of Hospital Fees Regulation (1985) which resulted in a substantial increase in the cost of health care to patients. Ghana's legislation is the most comprehensive in West Africa because there is full cost pricing of drugs and pharmaceuticals (World Bank 1987). Despite the launching of the expanded programme on immunisation (EPI) in the country in the late 1980s, the

[6] Access is defined as "the ability to reach a health facility within one hour of travel time or location within 8km radius of a facility" (Mooney 1977).

percentage of the population immunised remains poor. Ghana's immunization figures of 1993 compares less than favourably with its neighbour Togo's status with respect to high priority diseases (see Table 3).

2.4.4 Diseases profile

Ghana is characterised by a predominance of communicable diseases, under-nutrition and poor reproductive health conditions (GMTHS 1995). Malaria in particular has been and remains the first ranking of the top ten diseases in Ghana (see Table 4). It has been argued that malaria and the other communicable diseases are linked to overcrowding in most parts of Ghana (World Bank 1994).

Table 4: Ranking of the top ten diseases in Ghana 1991-1994

Diseases	1991	1992	1993	1994
Malaria	1	1	1	1
Diarrhoeal Disease	2	3	3	4
Upper Respiratory Infection	3	2	2	2
Accidents	4	4	5	5
Skin Diseases	5	5	4	3
Pregnancy Related complications	6	6	7	7
Intestinal Worm	7	7	6	6
Gynaecological Disorders	8	8	9	9
Acute Eye Infection	9	10	8	8
Hypertension	10	9	10	10

Source: Ghana-MoH 1994.

2.4.5 Malaria situation in Ghana

2.4.5.1 Clinical profile of malaria

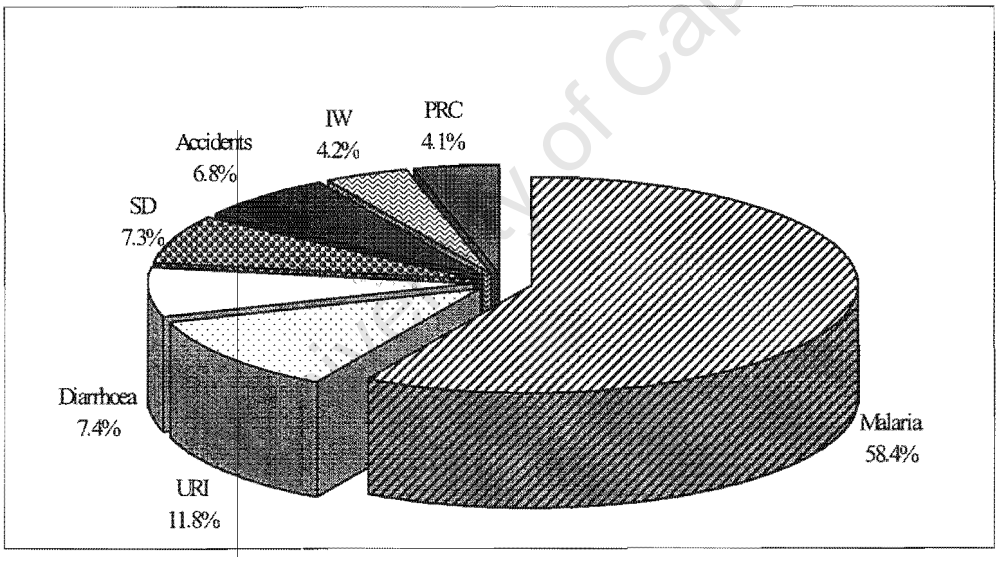
Malaria is transmitted by the parasite of the plasmodium species (Asenso-Okyere and Dzator 1997). The three species of human plasmodia found in Ghana include *P. falciparum, P. malariae* and *P. ovale*. The most dominant being the *P. falciparum* (the

principal vectors of the parasite are *Anopheles gambiae* and *Anopheles fenestus*), which accounts for 80-90% of infections. The P. *falciparum* is responsible for the most severe and dangerous form of malaria, with serious complications such as cerebral malaria and death (*Ibid.*). Malaria occurs all year round in the country with peak transmission between June and October (Binka *et al.* 1994).

2.4.5.2 The impact of malaria in Ghana

As noted earlier and further indicated in figure 3 below, malaria is the most prevalent disease in Ghana.

Figure 3: Morbidity profile of Ghana 1995



Source: MoH 1995, Annual Report 1994.
PRC- Pregnancy related cases; IW- Intestinal worms; SD- Skin diseases
URI- Upper respiratory infections

Information on malaria-related mortality is scanty. However, it has been found that the disease is a major cause of morbidity and mortality in Ghana, especially among infants and children under five years, who account for 40% of the cases (GHAT 1981; MoH

1992; Asenso-Okyere and Dzator 1997). Official estimates indicate that malaria accounts for 9% of the deaths in the country, 30% of the outpatient visits and 9% of hospital admissions (Asenso-Okyere 1994; Asenso-Okyere and Dzator 1997). Parents tend to have more children with the fear that some would die but this phenomenon further exacerbates population growth and impoverishes the people (GMTHS 1995). Although no reliable documentation is made, it is generally believed that malaria impedes the flow of trade, tourism, foreign investment and commerce, and thereby affecting the entire population (*Ibid.*).

2.4.5.3 The impact of malaria in the study area (K-N district)

Several malaria studies have been undertaken in the K-N district, all of which indicate that malaria remains a major health problem (Binka *et al.*1994; Binka *et al.*1996; Binka and Adongo 1997). Recent data from the K-N district hospital indicated that the leading diagnosis for patients treated at the outpatient clinic of the hospital was malaria, which further accounted for 60% of hospital admissions and 41% of hospital deaths. This was found to be consistent with the district hospital data where malaria, malaria-related anemia and gastro-enteritis constituted over 80% of causes of death (Ghana-MoH Report 1996). Interestingly, similar results were obtained 15 years ago (Ghana Health Assessment Team 1981). Deaths in the K-N district for which verbal autopsies[7] have been conducted also show that close to 30% were due to malaria-related anemia (Owusu *et al.* 1997). K-N district thus remains one of the most affected areas in Ghana, with malaria being the most common reason for seeking medical care among all age groups

[7] Involves going to a compound to ascertain through an interview a prompted and an unprompted account of the causes of death of a compound member. It is also know as Verbal Post Mortem (VPM).

and topping the list of causes of the loss of days of healthy and productive life (Ghana Health Assessment Team 1981).

2.4.5.4 Knowledge and perception of malaria in the K-N district

From both FGD[8] and cross-sectional survey conducted in the district (Owusu *et al.* 1997), it was shown that the people of the K-N district had a broad understanding of the common illnesses that affect them most, which include malaria, diarrhoea, stomach-ache, coughs, chills and head-ache (*Ibid.*). Amongst these illnesses, malaria was singled out as the most common and disturbing illness among all categories of people. Close to 80% of community members associated most fevers 'hot body' with malaria.

In the same survey (Owusu *et al.* 1997), it was shown that the community recognised the signs of malaria that included '*intolegre/yelona'* (hot body), vomiting, headache, cough, dizziness, diarrhea, chills and loss of appetite. The community also observed that the signs were more severe in children than adults. Hence, the community assessment of malaria is consistent with government records and findings from studies.

Less than half (44.7%) of the people from the K-N district attributed the causes of malaria to mosquito bites. Over 30% attribute the causes of malaria to eating 'sweet' and 'bad food' and 'standing in the sun'. This has potential negative implications for their health seeking behaviour in terms of the type and frequency of malaria treatment and prevention. Interestingly, approximately 47% of the people of the district believe that

[8] Focus group discussion

malaria can be prevented by avoiding mosquito bites (using treated bednets) and eating good and unsweetened food (*Ibid.*) There were no striking differences between urban and rural respondents. This might have been because the district has been involved in insecticide treated bednets (ITNs) studies since 1992.

It can be surmised from the above that the people of the K-N district have a fair knowledge about the causes, signs and prevention measures of malaria and have also recognised malaria as a major health problem in the district.

Chapter Three

LITERATURE REVIEW

3 Introduction

This chapter briefly describes the global malaria situation and reviews literature on the economic cost of malaria. The chapters examine approaches used in estimating the economic costs of malaria.

3.1 Global malaria situation

Malaria is present in 90 countries inhabited by some 2,400 million people (40% of the world's population) (Oaks *et al.* 1991). In any given year, nearly ten percent of the global population will suffer a case of malaria (*Ibid.*). It is worth emphasizing that, malaria remains one of the most significant causes of ill health in Africa, and each year causes over a million deaths and 300-500 million episodes of acute illness globally (Lennox 1991).

Malaria remains a growing global problem because of factors such as increasing drug resistance, population movements, and environmental and climatic changes. Moreover, increasing environmental degradation and exploitation, such as deforestation and irrigation have given rise to localized malaria problems in many parts of Africa. This has meant that several countries (e.g. Namibia, DRC, Ethiopia, Rwanda, Madagascar), have recently reported incidences of malaria, despite them not having experienced it previously (WHO 1992d; WHO 1993c; Chavasse *et al.* 1997).

3.2 Mortality and morbidity implications of malaria

The economic cost of malaria includes its impact on the economy, the local community, the household and the individual. Broadly, the costs that malaria imposes are borne through increased mortality and high morbidity, which are examined below.

3.2.1 Effects on mortality

The impact of mortality varies with the age distribution of death, which in turn vary by ecological zones (Over *et al.* 1992). In Africa and other regions, where malaria is highly endemic and malaria deaths occur primarily among infants and young children, the effect of mortality is different, than it is in areas of low to moderate endemicity where malaria deaths occur among the primary breadwinners or caretakers (Conly 1975). Substantial secondary effects are attributable to adult deaths as surviving household members adjust to the loss of those with primary responsibility for the well-being of the others. Arguably, the loss of an adult imposes tremendous economic loss on survivors (*Ibid.*).

3.2.2 Effects on morbidity

Information on increases in morbidity due to malaria is harder to obtain than mortality. Much of the research has concentrated on measuring the effects of bouts of the illness in terms of lower productivity and output.

3.3 Economic Impact of malaria

3.3.1 Impact on productivity and output

Previous studies of economic cost of malaria have focused on the direct cost or indirect effects on household budget and productivity (Van Dine 1916; Sinto 1938; Menon 1942; Khan 1966 and Malik 1966). In India, Bhombore, *et al.* (1952) estimated that households with malaria cleared only 40% as much land for crops as similar households without malaria in India. Gazin *et al.* (1988b) report that 17% of workers in an enterprise in Bobo Dioulasso claimed to have missed an average of 3.5 days of work in a previous rainy season because of malaria.

However the effect of malaria on reduced productivity and output remains a matter of controversy. Pehrson *et al.* (1984) discovered no differences in working capacity between Liberian industrial workers taking regular malaria chemoprophylaxis (a surrogate for no malaria) and those unprotected. The same team (Brohult *et al.* 1981) also reported no differences in working capacity between urban, protected populations and rural unprotected populations in Liberia.

Notwithstanding the controversies, it is generally believed that the quality of labour is affected by malaria morbidity both during acute attacks, and as a result of cumulative effects of the illness (Shepard *et al.* 1990). Even though an acute attack may not be severe enough to prevent work, the debility may reduce the quality productivity and output. In addition, malaria may affect output quality through an influence on the systems of production and decision about crops. Conly (1975) demonstrated this effect among rural

farmers in Paraguay, who shifted their work input under threat of malaria from tobacco and other lucrative cash crops to less labour-critical but also less valuable crops.

Labour quality is also affected in the long run by malaria's impact on education. In highly endemic areas 35 –60% of children learning abilities are often impaired by malaria (Macdonald 1950). Colbourne (1955) assessed school absenteeism at 5 days per child per year, among primary school students in Accra-Ghana. A study in the Solomon island (Kere *et al.* 1993) found that, on average each child lost 5.3 days of school each year and this translated into a loss of us$108,966 of the country's investment on education.

Assessment of the overall effects of malaria on productivity and direct economic losses can be divided into an analysis at the macroeconomic and macroeconomic levels (Shepard *et al.* 1990).

3.3.2 Macroeconomic effects

Earlier studies focused on the costs of malaria at the macro level. Howard (1909) had estimated the cost of malaria to the United States to be as high as $100,000,000 per year. In 1935, Sinto estimates that malaria was directly responsible for at least 2,000,000 deaths each year in India. Although these early studies did not evaluate the impact on individual and household levels, they highlighted the need for research in the area.

From the recent First Africa Malaria summit, it was noted as an issue of concerned that between 1965 to present day, the economic growth rates of Africa nations have been reduced by 40% as a result of malaria. According to Nabarro (2000) of Roll Back Malaria

Programme-WHO, the current total economic cost of malaria in Africa is $2 billion a year. Even more compelling is the fact that malaria death rate in Africa could be halved by investing between $200 million to $300 million a year in malaria control programmes. The call for commitment by all key players and actors to help reduce this enormous impact malaria is now.

Malaria is believed to discourage potential development opportunities by making certain zones unsuitable for habitation, deterring international trade and foreign investment, and jeopardizing the development of sectors such as tourism (Leighton and Foster 1993). Economic development may also be retarded by reduced access to international flows of knowledge and technology because companies may be reluctant to send representatives to malarious countries (*Ibid.*). Malaria may thus be a cause, and not just a consequence, of underdevelopment, poverty and misery in Africa.

3.3.3 Microeconomic impact of malaria

The microeconomic effects of malaria concerned with households and individuals. Table 5 summarises some of the economic costs of malaria studies in recent past.

Table 5: Summary of economic costs of malaria studies

Country (place)	Author(s)	Direct cost		Indirect cost		Total cost	
		in US $	%	in US $	%	in US $	%
Solenzo, Burkina Faso	Sauerborn *et al.* 1991	1.35	22.7%	4.61	77.3%	5.96	100%
Brazzaville, Congo	Brinkmann *et al.* 1991	3.20	36.5%	5.57	63.5%	8.77	100%
Rwanda	Ettling and Shepard 1991	2.58	21.8%	9.24	78.2%	11.82	100%
Mayo Kebbi, Chad	Shepard *et al.* 1991	0.20	2%	12.60	98%	12.80	100%
Sub-Saharan Africa	Shepard *et al.* 1991	1.83	18.6%	8.01	81.4%	9.84	100%
Malawi	Ettling *et al.* 1994	0.63	22.8%	2.13	77.2%	2.76	100%

At the household level, it is has been estimated that over a quarter of a very poor household's income can be absorbed in the cost of malaria treatment (Ettling et al 1994). This includes cost of drugs, special food, transportation, services and other related costs. Substantial cost is also incurred in terms of opportunity cost of labour lost to the illness, as each bout of malaria causes its victim to forego on average of 12 days of productive output (Shepard 1991). Mills (1991) has however argued based on a study in Nepal that an average of 5 days of productivity lost per non-fatal malaria episode was more realistic. In the literature, the average number of days per non-fatal disability of malaria episode regardless of its severity, vary considerably from 3 to 20 days (Quo 1959; Khan 1966; Niazi 1969; Wernsdorfer and Wernsdorfer 1988; Sauerborn *et al.* 1991)

Amongst the poorest countries of Sub-Saharan Africa, households have been found to spend between $2 and $25 on malaria treatment and between $0.20 and $15 on prevention each month (Leighton and Foster 1993). Treatment cost of malaria for small farmers have been estimated to be as high as 5% of total household expenditure in Kenya and 13% in Nigeria (*Ibid.*).

In Thailand, Kaewsonthi (1989) had attempted amongst other things, to measure the costs borne by patients in seeking care. These costs amounted to $20 per positive case, which was nine times the average daily wage. This estimate was specifically for those seeking care from a malaria clinic and therefore did not include those who sought care elsewhere. The degree of underestimation of the cost to sufferers may be quite high, as time lost before and after seeking treatment can be considerable, and is often not reported.

Ettling and Shepard (1991) estimated the average cost per case of the 1,722,271 reported malaria cases in Rwanda in 1987 to be $11.82 per case ($2.58 in direct costs and $9.24 in indirect cost). In per capita terms, the cost of a malaria case was $2.88 per capita. That is $0.63 per capita in direct costs and $2.25 per capita representing the indirect costs of productive time lost to malaria morbidity in adults and to care for sick children, and the cost of lifetime earnings lost through premature mortality. It was found that the per capita malaria cost equal 3.5 days of production.

In Solenzo, in neighbouring Burkina Faso, Sauerborn *et al.* (1991) found the total cost of malaria in 1985 to be $7,390, which was approximately 1% of total production. The cost averages $1.15 per capita. Each case of malaria cost on average $5.96, the equivalent of over 19 days of per capita output. Average direct cost was $1.35 per case, representing over 11 days of average per capita cash income. Over 28% of the total cost of malaria was borne directly by the community in the form of out-of-pocket payments of treatment and current loss of adult production due to malaria morbidity.

The United States Agency for International Development (USAID) initiated an effort in 1990 to quantify the economic impact of malaria in Africa on the basis of studies that had been already conducted. In the first article, Shepard *et al.* (1991) presented a framework for measuring the economic impact of malaria and illustrated it using data from Rwanda, Burkina Faso, Chad and the Congo. The conclusion of the study was that in 1987, a case of malaria cost $9.84 ($1.83 in direct costs and $8.01 in indirect costs) and this was equivalent to 12 days of output. It was predicted that by 1995, the average cost of malaria

case would rise to $16.40 due to increasing severity, chloroquine and other related drug resistance.

Ettling *et al.* (1994) estimated the indirect costs of malaria on the basis of days of work lost to be $2.13 for Malawi households. The direct cost of seeking treatment was $0.21 per child case and $0.63 for adults. These costs can be a substantial percentage of household income, especially for poor households whose ability to consume other health and non-health goods could be adversely affected.

Brinkmann and Brinkmann (1991) generalized that on average a semi-immune person with uncomplicated malaria will be unable to work for 3.5 days and that in children, the duration of sickness will be 5 days. This assertion is due to the fact that malaria attack depends on the level of acquired immunity and the availability and administration of effective treatment. They were also of the opinion that the duration of the period during which a patient is unable to work depends on his or her general health and nutritional status, attitude and motivation and the type of work accomplished.

In Colombia, Bonilla and Rodriguez (1992) found that the economic and social costs due to malaria were clearly perceived by rural households. They found that a third of the cost of illness was represented by the costs of the treatment (direct cost) and the remainder by time lost by the patient and the caretaker representing indirect cost.

3.4 Approaches to estimating the economic cost of malaria

Malaria inflicts direct, indirect and intangible cost on households and individuals through its effect on mortality and morbidity. The ideal approach in estimating the general economic cost of illness including malaria is the willingness to pay (Shepard *et al.* 1990). Economic theory suggests the value of a consumption good should be determined according to the willingness to pay (WTP) method (Lipsey *et al.* 1990). Health, like food, is worth what a consumer is willing to pay for it. This approach simply asks: "how much money would a sick person be willing to pay to get better or how much a healthy person would pay to avoid getting ill"? Despite the theoretical soundness of this approach, Shepard *et al.* (1990) noted that it has not been widely applied due to its practical constraints (e.g. an evaluation of the risk of death).

In evaluating the economic cost of malaria with regard to mortality, some approaches assign monetary values for lives lost, by attempting to calculate an actuarial value for a human life. Suarez (1973) estimated a life to be worth US $2,000, however, the approach has been criticised as it implies that human lives can be reduced to their work capacity, which can be bought for money (Franco 1981) and that a person's worth be considered in terms of their exchange value (Breilh 1979).

Estimating the direct cost of malaria entails basically the summation of cash expenditure on treatment and prevention. The major components of direct costs in many studies are often drugs and transport, but direct cost on special food is often erroneously left out in the estimation of direct costs and this may lead to underestimation (Sauerborn *et al.* 1991; Ettling *et al.* 1994).

The approaches to estimating indirect cost are more sophisticated than direct cost as it involves estimating the value of time loss to productivity. Other researchers have tried to estimate the value of time loss due to malaria by dividing the market value of the agricultural output by the amount of person-time used to produce it. This factor is then multiplied by the average number of days a person is sick with malaria (Sauerborn *et al.* 1991). However, this approach may lead to an overestimation of the value of time by ignoring the returns to other inputs such as fertilizer and pesticides.

Another approach is to estimate the value of time by dividing the average household income by the mean number of adults per household and assuming a six-day work-week (Ettling *et al.* 1994). This type of estimation requires accurate income data (which is difficult to obtain in developing countries) and a clear definition of the economically active population.

Some studies have also tried to measure the indirect cost of malaria by estimating its effect on agricultural output at households' levels (Conly 1975; Audibert 1986). These approaches require very comprehensive data collection, and methodological difficulties have to be overcome. These difficulties relates to the problem of isolating the impact of malaria on agricultural yield, making it necessary to control for a host of other factors that could explain the differences in the output.

The more comprehensive approach[9] used to evaluate the indirect cost is based on the opportunity cost of labour days lost (wages forgone as a result of malaria). In this way, the value of labour days lost is not necessarily seen as measure for the loss of production but more as an indication of potential income lost and a possible financial cost of replacing labour for the sick person. Again, in this way, the opportunity cost provided an estimate of the income forgone per day by the inability to work due to the sickness or caretaking. Because of these advantages, the approach is used in this study.

3.5 Summary

It is can be inferred from the literature review that malaria inflicts economic cost through its effects on mortality and morbidity. Apart from direct cash expenditure on malaria care, government, communities, households and individuals incur substantial indirect cost in terms of reduced productivity and output, resulting from days lost to production. The number of days lost to production range between 3 to 20 days resulting in higher indirect cost than direct cost. In general, indirect cost often accounts for more than 60% of total cost of an episode of malaria and outweighs the direct cost of malaria. The third category of cost is intangible costs, which includes emotional and psychological distress as a result of a malaria bout but these costs are often difficult to measure.

Estimating direct cost involved the summation of out-of-pocket on drugs, special food, transportation, services and related expenditures. Indirect cost estimation involved the use of the comprehensive estimation approach of the opportunity cost of labour (wage forgone) as discussed in the previous section. These approaches were used in the study.

[9] Korandsen *et al.* (1997) used this approach in a similar study in Sri Lanka.

CONCEPTUAL FRAMEWORK

4 Introduction

The chapter examines the conceptual framework used to estimate the direct and indirect costs of malaria in this study.

4.1 Level of economic cost analysis

As Castro and Mokate (1988) noted, costs of diseases including malaria can be analysed either from a macroeconomic or microeconomic perspective. In other words, the combined impact or effect of both the direct and indirect costs can be analysed either from the perspective of the individual, household or society as a whole.

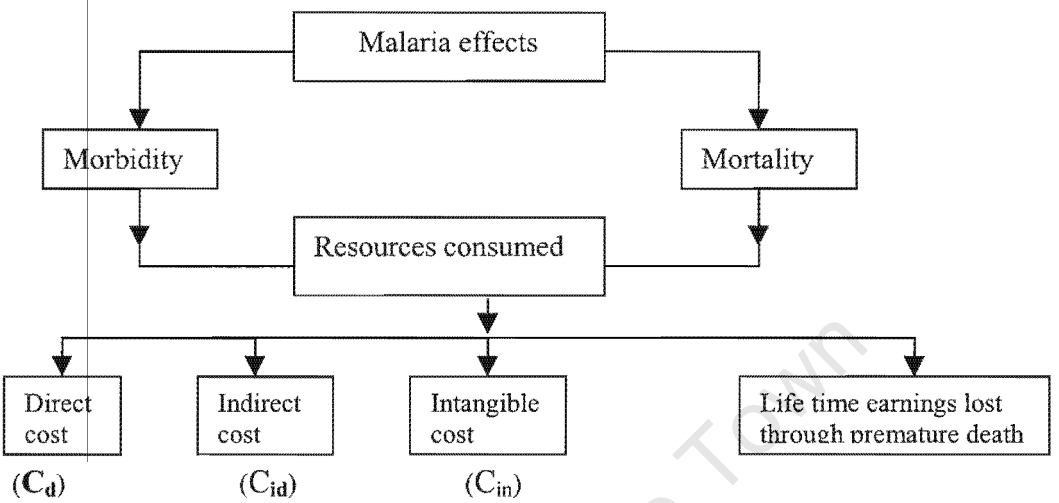
The macro effects could be analysed through the evaluation of national control programmes in relation to national product while the micro level study considers the impact of the disease on individuals and households. The availability of the levels of macro costs can aid in health planning and cost effectiveness analysis and knowledge of the micro costs is useful in assessing the ability of individuals and households to afford health care. This study relates to costs at the micro level.

4.2 The framework for estimating the economic cost

The most comprehensive framework for estimating the economic cost of malaria was developed by Shepard *et al.* (1990) (see Figure 4). Due to the difficulties in obtaining good estimates for lifetime earnings lost through premature death (Lennox 1991), the

original Shepard's model, which did consider the cost consequences of death was employed in this study (see Figure 4).

Figure 4: Economic effects of malaria.



(C_d) = f [cost of drugs, consultation cost, laboratory service charges, other user charges, transportation costs, special diet]
(C_{id}) = g [opportunity costs of travel, waiting and lost of productive time]
(C_{in}) = h [monetary value of pain, grief and suffering of patient and family]

Source: Shepard *et al.* (1991).

In evaluating the economic consequences of malaria, the resource implications of mortality and morbidity need to be considered (see Figure 4). In the absence of health insurance or government funded services, expenditures on health care are wholly borne by individuals, and their households (Guiguemde 1994). Even when cash expenses are not involved there is opportunity cost of time spent in seeking treatment or being unable to work because of the debility caused by the disease. These costs can be classified into direct, indirect and intangible costs (see Table 6), which are discussed in further detail in the subsequent sections.

Table 6. Sources and effects of economic costs of malaria

Type	Source	Effect
Direct costs	Treatment and prevention mortality, morbidity, debility	Expenditure of households and governments
Indirect costs	treatment time, waiting and travel time	Economic output (e.g. crop production)
Intangible effects	Health status	Quality of life

Source: Adapted from Shepard *et al.* (1991)

4.2.1 Direct cost

The direct cost of malaria includes out-of pocket payment for travelling to seek care, treatment and cash payment for preventive measures taken by individuals, households, governments and non-governmental organizations. Specifically, direct cost includes direct payment for drugs (including injectables), special foods for malaria patients, consultation, laboratory tests and transport charges to and from health care facilities and or drug stores. Government and non-governmental organization's expenditures on drugs and control programmes are also included in this category of cost if patients are not fully surcharged for them. Care must often be exercised to avoid double counting, since there are often overlaps in the activities of government and NGOs.

4.2.2 Indirect cost

There is an opportunity cost to time used, since time can either be used for productive activities or leisure (Shepard *et al.* 1990). Time could be considered as a scarce resource and could be valued at the marginal product of labour (MPL)[10]. The concept of marginal cost of labour (MCL)[11] is usually used by economists to evaluate the opportunity cost of

[10] MPL is the output as a result of engaging an additional labour input in production (Lipsey *et al.*(1990).
[11] MCL is the addition cost as a result of an additional labour input in production (Ibid.).

time. In subsistence agriculture with easily available land, such as the K-N district, labour is by far the most important input variable to production, and MCL can be approximated by the MPL (Brandt 1980). The MPL relates the market value of output to the amount of labour resource used in the production process. In economic theory, maximization implies that labour will be hired up to the point where MCL = MPL = wage rate (Lipsey *et al.* 1990).

Thus, the indirect cost category relates to the value of time lost to malaria through morbidity and mortality (Shepard *et al.* 1990). Asenso-Okyere (1992) observed that malaria is characterized by successive episodes of febrile feeling coupled with musculoskeletal pains, headache and intestinal symptoms, which are often followed by exhaustion and weakness. The duration of an attack of malaria depends on the level of acquired immunity and the availability and administration of effective treatment, among others (Sauerborn *et al.* 1991). As noted earlier, when the disease is severe the patient is unable to carry out normal productive activities, thereby reducing the time available for production. Even when a person who is suffering from malaria does not stop working, his/her productivity may be affected.

Time lost to production as a result of the disease may include travel time to health care facility or drug store, time to health care facility by an individual waiting for a turn to consult a prescriber or obtain some service (Asenso-Okyere and Dzator 1996). Sometimes management of the disease may involve another household member who would be the caretaker, especially in the case of children.

With regards to work output and earnings, life lost to disease through premature death is an indirect cost to households and society in general. Some individuals are the breadwinners of their households and a premature death precludes the household from enjoying the benefits of their labour. When a person in the active labour force dies, his/her contribution to the gross domestic product is lost to society. However, the indirect cost due to premature death is difficult to estimate as it involves expectations about future earnings requiring sophisticated models and assumptions for their prediction

4.2.3 Intangible cost

The intangible impact of malaria is defined in relation to its impact on the quality of life (Shepard *et al.* 1991). Health is both a consumption and investment good. As consumption good, it is a characteristic valued in its own right. Like better food or better housing, better health is an attribute that increases its owner's quality of life. The investment nature of health is directly linked with productivity and output as result of good health (Lipsey *et al.* 1990). Malaria affects the quality of life of the victims as it can reduce the desire to consume food and other resources for a happy and enjoyable life (see Table 6). These forgone consumption and pleasures are rather difficult to quantify.

4.3 Focus of the study

The focus of the study was on direct and indirect components of the economic costs of malaria. Intangible costs although recognised as being important, are difficult to quantify and were not considered in this paper.

Chapter Five

METHODOLOGY

5 Introduction

This chapter describes the methods of fieldwork used in the study. It outlines the sampling frame, study area, the sample size, the sampling techniques and the data collection techniques. Further, the chapter explains the survey instrument and its content, data management and quality checks, estimation methods, data analysis and a dissemination plan. The chapter concludes with an explanation of the study limitations and how ethical issues relating to the study were circumvented.

5.1 Malaria case definition

Malaria, whether severe or mild is commonly known as *paa* and *pua* in Kassem and Nankam respectively. Such a local definition though practical for a retrospective study, is not ideal since it refers to 'fevers', and is not only restricted to malaria with parasitaemia. Respondents judged malaria or fever attacks as severe and mild based on the debilitating nature on a household member at the time. Severe malaria was a situation where the individual could not go about his/her daily activities. On the other hand, mild malaria was a situation where an individual could sometimes cope partially or fully in carrying out his/her normal activities.

5.2. Study area

The study was carried out in the K-N district of the Upper East Region of northern Ghana (see Figure 1). The K-N district is the only district in the region, which has been

extensively researched with regard to health and population issues, and more specifically on malaria. It has thus been recognised that the population of the district has a fair knowledge about malaria (causes, symptoms and preventive strategies) (Owusu *et al.* 1997). The district has also since 1992 been under demographic surveillance by the Navrongo Health Research Centre (NHRC), based in the K-N district.

NHRC has developed a surveillance system, which is up-dated every ninety days and basic and vital demographic information such as, pregnancies, births, deaths and migrations among others are routinely obtained for the district. Since 1992, NHRC, for ease of research, has divided the K-N district into five zones namely south, east, central, west and north. The zones are further divided into sub-zones and clusters of geographical contiguous compounds[12] (Binka *et al.*1997).

The population of the district is estimated at 140,000 (Binka *et al.*1997) with three main ethnic groups namely the Kassenas and Nankanis and the minority Bulsas. The Kassenas predominate in the west, north and central areas, whilst the Nankanis occupy the east and south, and the minority Bulsas also reside in the south. Apart from the urban area, which occupies the central zone, the rest of the population is rural, and lives in dispersed settlements, which consist of compounds, made mainly of mud, with mud, thatch and occasionally zinc roofs.

[12] A traditional multi-roomed dispersed house in the study area. It is usually walled together and it houses one family unit, which could include several generations of the family. It is recognised by the name of the head of which there is only one. There are on average three households in a compound.

The district is in the Guinea-Sudan Savannah transition zone and is characterised by a dry climate with a single rainfall regime and two distinct seasons, namely the dry and the wet seasons. Temperatures are relatively high, ranging from 19.8°C to 42°C, which provides favourable grounds for the breeding of mosquitoes.

The economy of the district is based on farming and rearing livestock. About 75% of the people depend directly on farming for their livelihood. The tradition of domestic animal keeping produces marshy and unsanitary conditions around compounds, which also favours the breeding of mosquitoes.

In terms of health services, the district has one district hospital, four government health centres, a few missionary clinics, a diverse set of private dispensaries and traditional providers.

5.3 Sample selection

A representative sample was drawn from the population to ensure fair representation of the rural and urban areas and the ethnic groups. A multi-stage simple random technique was used in this survey.

First, the north zone was randomly picked from the west and north zones which represented the Kassenas and the south zone was also randomly picked from the south and east zones which represented the Nankanis/Bulsas ethnic groups. The central zone was automatically selected, as it was the only urban area.

With the second stage, each fieldworker randomly selected a cluster from all the clusters that were selected. A list of the compounds in each of the clusters selected was obtained from the computer centre database of NHRC. Fieldworkers randomly selected a compound in which to begin interviews, from the lists provided by NHRC. Fieldworkers then started interviews from the compound selected and proceeded thereafter with the remaining compounds in a radial form.

5.3.1 Sample size

The question of the number of households to be included in the survey was addressed statistically, to achieve a desired representative sample. Kaewsonthi and Harding (1992) suggest that when the total number of households is greater than 10,000, then the sample size required can be calculated using the following formulae:

$$n = \frac{z^2 \times p \times q}{d^2}$$

Where;

n = sample size of population frame.

z = the degree of confidence (odd ratio) with which it is required to be within the specified range **(+/-d).** A value of **z = 2** is chosen since this provides a degree of **95%** confidence interval.

p = the variability of malaria in the population. As there is no 'reasonable' estimate of **p**, then we use **50% (p = 0.5).** This maximises the expected variance **(pq = 0.25)** and ensures the sample is large enough for the study.

q = 1- p

d = the largest acceptable percentage of difference between the estimated value from the sample and the true population value. In the study the degree of accuracy is set at 5% (0.05).

Hence, our sample size was:

$$n = \frac{(2)^2 \times (0.50) \times (0.50)}{(0.05)^2} = \underline{\textbf{400 households}}$$

5.4 Unit of analysis

The unit of analysis in this study was the household. For the purpose of this study, a household was defined as a group of persons living in the same compound who shared the same food (Guiguemde *et al.* 1994; Leibbrandt and Woolard 1999). The household was chosen as the unit of analysis because the household rather than the individual generally operated as an economic unit in this setting. Information was principally collected from either the head of a household or an adult member if a household head was absent.

5.5 Training and fieldwork

The researcher adapted an existing training manual from the NHRC for the study. The training manual gave the background of the study, aim and objectives of the study, the role of the interviewer and strategies for community entry among others. Eight fieldworkers with experience in conducting interviews with the centre were selected from a pool of 22 fieldworkers who had just completed data collection for a similar survey.

Fieldworkers were trained for two weeks on carrying out interviews. Mock interviews were also used in the training. This was followed by a carefully supervised pilot test to assess the competence of the interviewers.

5.6 The survey instrument and data collection technique

5.6.1 The survey instrument

The main aim of the study was to obtain estimates of the direct and indirect costs of malaria care to households. In order to do this, a survey instrument (see Appendix 1) was designed, translated into the various dialets and divided into four sections in which the following investigations were obtained:

1. Socio-economic and demographic characteristics of respondent;
2. Household possessions and assets (wealth);
3. Direct and indirect costs of malaria care to households and
4. Household consumption expenditure and debt.

The first section sought respondent's (household or adult household member) information relating to socio-economic and demographic characteristics such as age, ethnicity, marital status, educational background, occupation, religion and household size.

Section two obtained information on household assets (e.g. motor vehicles, bicycles, fridge, sewing machines, beds, electric lamps, etc) and the extent to which utilities (toilets and utensils) were shared with other households. This information was essential for determining household wealth and ability to pay for health care including malaria care.

The third section obtained data on the indirect and direct cost of seeking malaria care to households over one month recall period. Information was obtained on the number of

malaria cases in the household, the duration of the episode, its severity, whether or not health care was sought, and type of health care sought, means by which health care was sought. Questions relating to waiting time and days loss as a result of a bout of malaria were also included. In addition, reasons for not seeking care were also obtained from respondents. The final part of the section elicited information on the direct expenditures made on seeking malaria care, which included cost of special food, tranport, drugs, diagnosis and consultations and other related costs. Information was also obtained on whether or not the malaria patient had a caretaker, and various questions relating to productive losses incurred by the caretaker were posed.

The last section sought information on household basic (e.g. food, education, etc.) and occasional (e.g. capital goods, celebrations, etc.) expenditures for the previous month. Information on households' expenditure was essential to estimate the proportion of household expenditure on malaria care. The alternative would been to use household income, however Ravallion (1992: 13) amongst others, has emphasised the appropriateness of expenditure as a proxy for income in household surveys. This is especially important when considering poor households because of the subsistence nature of such households production systems, and the lack of information on income sources.. The last bit of data gathered in section four was on the level of debt incurred by households.

5.6.2 Data collection technique

After training, fieldworkers were deployed to their various clusters for the survey. Intensive data collection was completed in three weeks (from 20th January 2000 to 11th February 2000). 435 interviews were conducted, which was an additional 35, and after adjusting for missing information and similar issues, 423 questionnaires were successfully completed, which was still in excess of the required number of interviews.

In each compound, only households where member(s) had experienced an episode of malaria in the previous four weeks (month)[13], were interviewed. The study employed self-reported[14] cases of malaria (in retrospect) of households. It is believed that households are able (with a high percentage of accuracy) to self-report a malaria episode.

5.7. Data management and quality checks

To ensure quality of work, completed questionnaires were first checked by a field supervisor for errors and inconsistencies. The questionnaires were then rechecked by the researcher to ensure that errors and inconsistencies that were not detected by the supervisor were corrected before data entry. Any query or inconsistent questionnaire was returned to the fieldworker in question for a re-interview with the respondent. Quality control checks were also done where some of the questionnaires were randomly selected and the respondents revisited and interviewed to make sure that fieldworkers actually conducted interviews in the study areas.

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[13] One month so as to reduce the problem of recall. This method was also employed by Sauerborn R. *et al.* (1991) and found to facilitate better recall.

[14] This method has been used by Sauerborn R. *et al.* (1991) in their cost of malaria study in Burkina Faso and also Ettling M *et al.* (1994) in their economic impact of malaria in Malawian households.

All the survey questions were pre-coded and the database was constructed using the FoxPro (version 2.6) database management program, by data managers of NHRC. The forms were put into batches and given form numbers to avoid loss of forms. The data was entered twice by two data entry clerks (DECs) of NHRC and a verification check was run by a data manager to ensure that the data was correctly entered.

5.8 Estimating the economic costs

This section describes the approach used in estimating the direct and indirect cost of malaria.

5.8.1 Estimating direct cost

In this study the direct cost of malaria included all cash expenditures on seeking malaria care by malaria victims and their caretakers. The components of the direct cost included cash expenditure on special food, transportation, drugs, services and all other out-of-pocket expenditures made on malaria care by malaria patients and their caretakers (if there was one). These costs were recorded on the questionnaire as reported by the respondent. In cases where respondents could not recall the specific amounts, lump sums were recorded. Where receipts of purchase were available, they were cross-checked with the verbally reported figures and this helped to reconcile some of the figures reported. All direct costs were then estimated to obtain the average and total values of cash expenditure on malaria episode to households.

5.8.2 Estimating indirect cost

In computing the indirect costs in this study, a few assumptions had to be made. First, the adult working force comprise all people from age 18 to 60 which correspond to the age of maturity and retirement in Ghana respectively. Secondly children under age 12 do not work which means their opportunity cost of labour can be assumed to be zero. Those (not in school) between the ages of 12 and 17 earned half the income of adult males and females, if they work. Finally, people above age 60 were retired and their opportunity cost of labour, was assumed to be zero.

Malaria patients were asked how much they would have earned a day if they were not disabled by the malaria episode. Similarly, caretakers were asked how much they would have earned per day if they did not have to take care of the malaria patients (mostly children). The mean earnings per day reported by men and women in the study did not vary much with the prevailing agricultural wage earnings in the district. Thus, the prevailing agricultural wage was used in the estimation. The alternative could be to value time lost to malaria by using the value of output lost during the malaria episode. Although the study was at a period of reduced agricultural activities, people were engaged in dry season farming and rearing. Others also engaged in trade in the village markets, which come off every three days. Even though demand for agricultural labour is known to have peaks and slumps at different periods of the year (Sauerborn *et al.*1991), the agricultural wage used here was assumed to be constant because of the many other activities that tended to stabilise people's income. Besides, the agricultural wage rate did not differ significantly from the reported foregone earnings of malaria patients and

caretakers. The daily avearge agricultural wage in the district was found to be ¢4,500 (US$1.20) and ¢4,000 (US$1.07) for males and females respectively. The inter-Bank rate at the time (January 2000) of the study was US $1 to ¢3,750 (Ghanaian currency).

In estimating the total indirect cost that an economically active malaria patient and caretaker incurred when absent from their normal productive activities due to a malaria attack, the total time lost was considered for age-gender specific categories. The daily average agricultural wage was multiplied by the corresponding number of days and total waiting time lost to productivity for both rural and urban households. Like rural households, the main occupation of urban household in the district was subsistent farming. In addition to rainfed farming, most urban households are engaged in small-scale irrigation farming close to the town.

5.9 Data analysis

The researcher used a STATA software package for data analysis.

5.10 Dissemination

The study intends to make final report copies available to the WHO/TDR Geneva, the Health Economics Unit (University of Cape Town), the NHRC (Ghana) and the Ghana Ministry of Health (DHMTs, RHMTs and Headquarters). Workshops will be held to brief interested parties including the communities of the K-N district on the findings of the study. The researcher will also use the findings of the study to write papers for conferences and publications in an international peer-review public health journals.

5.11 Study limitations

The study considered only the direct and indirect costs of seeking malaria care, and does not include intangible costs such as psychological, pain and trauma costs. Although recognised as being important, it was beyond the scope of the study to examine them. The study also did not include cost of malaria prevention since emphasis was on costs of seeking malaria care. From the results of the pilot test, it was difficult to capture length of travel time to seek health care (a component of indirect cost) of malaria patients and caretakers, and so it was not considered. The study was also limited to self-reported malaria episode at the household levels. Finally, the study was limited to the K-N district, which is homogeneous in terms of its socio-economic and demographic characteristics. This implies that the extent to which the results can be generalised outside of the study district are limited to those with similar socio-economic and demographic characteristics.

5.12 Ethical issues

The probable ethical issue envisaged was the encroachment of households' privacy through questions relating to assets and expenditure. However the researcher took appropriate measures by firstly obtaining an institutional clearance form the director of the NHRC. Secondly, permission to conduct the study was obtained from the chiefs and stakeholders from the district. Finally a detailed consent form (see Appendix 3) was read and explained to all participating households in the various local languages, before interviews commenced. Respondents were assured of the confidentially of their responses.

RESULTS

6 Introduction

This chapter reports the findings in both the descriptive statistics and the estimated direct and indirect costs of malaria care.

6.1 Descriptive statistics

6.1.1 Demographic and economic characteristics

The research was designed to capture a proportional representation of the rural and urban population in the area, hence 72% of the randomly sampled households were rural whilst the rest (28%) were from the central urban area. The survey revealed that the number of people in each household ranged from 1 to 19. There were 2,228 people in the 423 study households, which yielded an average household size of 5.3 persons for the district (see Table 7).

Out of the 423 households successfully interviewed, 48% were adult members of the households. Almost two-thirds of the household heads were female. The ages of respondent ranged between 17 and 85 years with a mean age of 39.5years. Seventy-three percent of households heads/adult members interviewed were married, 14% were widowed and the rest were, single, divorced or separated.

With regard to educational levels, 60% of the respondents have never been to school, 30% had either attempted primary or completed only primary school and only 8% and

3% have had secondary school and tertiary education respectively. More than three-quarters of household heads/adult members were either subsistent farmers or petty traders, and less than 10% were in the formal sector of employment (see Table 7).

Table 7: Demographic characteristics of respondents (n = 423)

Questions	Options	frequency	percentage
Respondent	Household head	213	50.4
	Adult member	210	49.7
Sex of respondent	Male	165	39
	Female	258	61
Location of household	Rural	306	72
	Urban	117	28
Ethnic background	Nankanis	131	31
	Kassenas	272	64
	Bulsas	10	2
	Other	10	2
Marital status	Married	308	73
	Never married	20	5
	Divorced	23	5
	Widowed	59	14
	separated	13	3
Educational level	None	255	60
	Primary	127	30
	Secondary	33	8
	tertiary	8	2
Occupation **	Subsistence farmer	175	41
	Large scale farmer	15	4
	Trade/artisan	156	37
	Civil servant	9	2
	At school	1	0.3
	Too old to work	16	4
	Other	51	10.7
Religion	Traditional	183	43
	Christian	194	46
	Muslim	46	11
Question	***Statistical results***		
Age	-Age range between 17 to 85 years -Mean age was 39.5years		
Household size of the 423 households	-Total household members were 2,228people -Range 1 to 19 persons per household -Mean household size was 5.3 people		

**Economic characteristic.

6.1.2 Malaria profile in the study area

The survey revealed a total of 615 malaria cases in the 423 study households in the month prior to the household survey. This yielded an average of 1.45 malaria cases per household. The majority (97%) of respondents regarded malaria as the most common disease in the area. With regard to severity, 71% were regarded as mild cases and 29% as severe. In terms of location, 72% of the cases were reported from respondents in the rural area.

More than half (57%) of the cases were women and 53% of all the cases were children below the age of 15. Thirty percent of the cases were children of under the age of 5. Twenty-one percent of the malaria cases were attending school at the time of the survey and 5% who were children between the ages of 12 and 17 and not attending school were working in some form. It was also found that 76% of the malaria cases had caretakers and 66% of the caretakers were women between the ages of 17 and 65. Forty-three percent of the malaria cases and 96% of the caretakers were from the economically active population, which is between the ages of 18 and 60 in Ghana.

6.1.3 Health seeking behaviour

When an individual is ill there are two options i.e. to seek health care or not to seek health care. As Mwabu (1986) hinted, such choices are dependent on several factors including education, socio-economic and demographic factors of the individual or household. In the survey, 94% of all who got malaria sought one form of health care or the other, despite the fact that 72% of these cases were regarded as mild. Of the few (6%)

who did not seek any form of health care, 41% did not do so because of lack of money and 69% did not seek health care because the disease was perceived not to be severe at the time. Sixty-eight percent of the malaria patients sought modern care only, 17% sought traditional care and 15% sought both forms of health care. As to the type of modern health care sought, 20% of the cases attended the district hospital, whilst 23% preferred the chemist (chemical shops), 19% took to self-medication and sought care from drug peddlers and 38% obtained treatment from the community health workers and the health centres/clinics.

6.1.4 Sanitation and water

Particularly disturbing is the indiscriminate human waste disposal in the district. The study revealed that as high as 92% of households in K-N district use the free range (indiscriminate defecation) as their toilet facility. With regard to water, majority of households (65%) obtained their water from the borehole and close to 30% of households relies on well water.

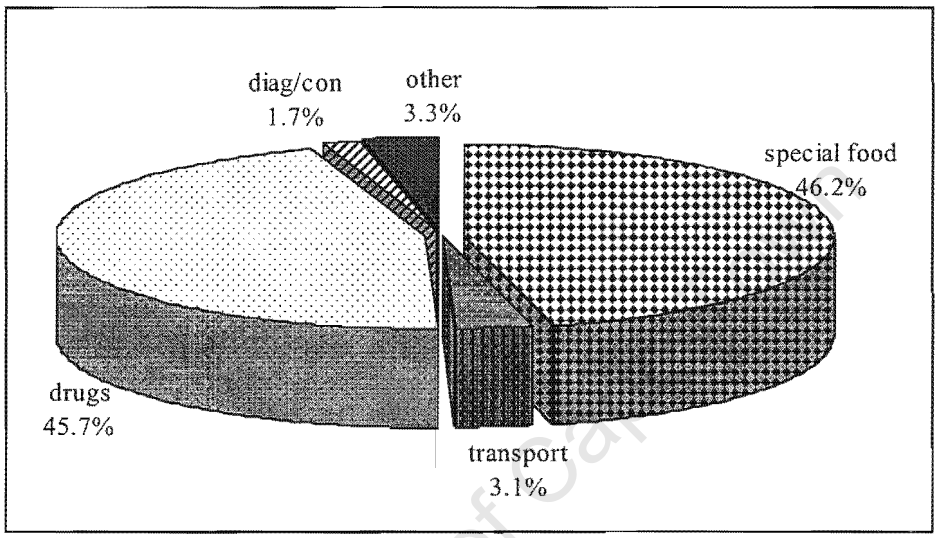
6.1.5 Economic cost of malaria

6.1.5.1 Direct cost

The direct cost of illness is of two types; those borne by patients obtaining care and those borne by the health systems in providing care. The survey questionnaire measured patient out-of-pocket expenditure on travel, drugs, services (diagnosis and consultation), special food and other related expenditures (e.g. impatient, toiletry costs, etc.) (see Figure 5). At the time of the survey, there was a government health policy that exempted children

under five, pregnant women and the over-seventies from paying for health services in public health facilities. Apart from these exemptions, fees are collected for services in the private and public health providers.

Figure 5: Components of direct cost of malaria care

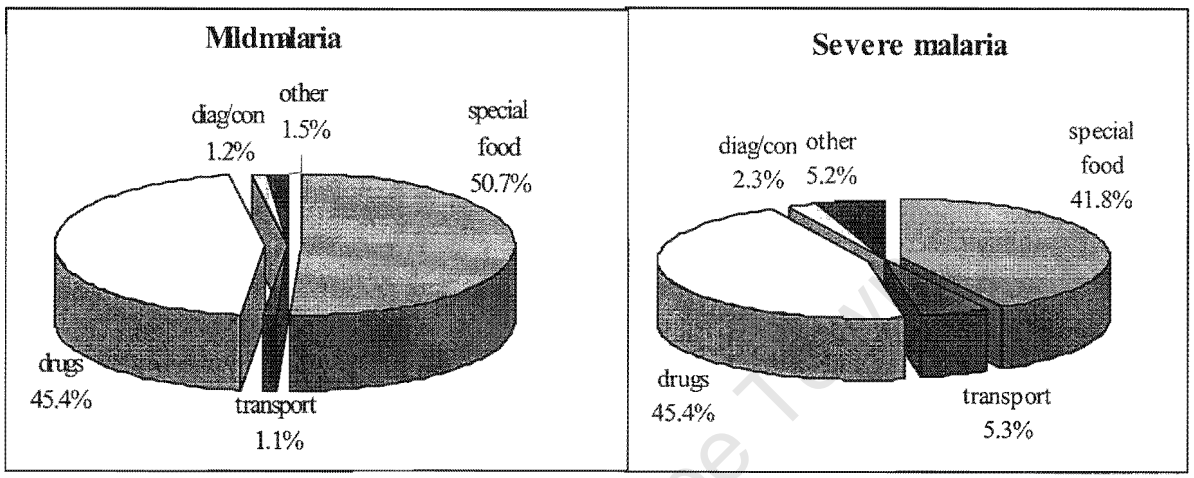


It was found in the survey that expenditure on special food (46.2%) and drugs (45.7%) were the major components of direct cost of malaria in the district (see Figure 5). Transport cost was 3.1% of total direct cost, with services (diagnostic and consultation) and other related expenditure accounting for 1.7% and 3.3% of total direct cost respectively (see Figure 5).

When categorising malaria in terms of severe and mild cases, special food and drugs remain the major components of direct cost in both cases (see Figure 6). However, in the case of severe malaria, the proportion of direct cost on drugs (45.4%) is higher than the proportion of special food (41.8%). With mild malaria, the proportion of special food (50.7%) was higher than drugs (45.4%). The proportion of service costs (diagnostic and

consultation), transport and other related direct cost were generally higher in severe than in mild malaria (see Figure 6).

Figure 6: Components of direct cost by severity



6.1.5.2 Indirect cost

It was found that the number of days that an individual (independent of age, gender severity and location) suffered from malaria was 5.2 days. With regard to severity an individual suffered 6.8 days in the case of severe malaria and 4.5 days in the case of mild malaria. However an adult malaria patient could not work or go about his/her normal activities for an average of 5.3 days with severe malaria and 2.6 days in the case of mild malaria, which was the same for a caretaker. The research revealed that 26% of both malaria patients and caretakers could not work at all for the period of the malaria episode, and 52% could only do work partially. The mean income lost per day due to malaria was ¢4,486 ($1.20) for men and ¢4,002 ($1.07) for women. These daily rates for men and women were assumed to be the same for caretakers.

The research revealed that patients and caretakers can often wait up to six hours to see a health worker, with waiting time ranging from 5 to 360 minutes. The mean waiting time (irrespective of severity and location) was approximately 26 minutes.

Also critical and worth noting is school absenteeism due to malaria. Adjusting for holidays and weekends, 129 pupils/students of the K-N district could not go to school for a total of 530 days due to malaria (see Table 8). The number of these malaria cases represented 21% of the 615 malaria cases in the study area. Table 8 below indicates school absenteeism by location and severity.

Table 8: School absenteeism by severity and location (days lost)

Absenteeism	Location			Severity		
	Rural	Urban	Total	Severe	Mild	Total
Number of cases	69	60	129	45	84	129
Days lost from school due to malaria	264	266	530	245	285	530
Mean days lost due to malaria	**3.8**	**4.4**	**4.1**	**5.4**	**3.4**	**4.1**

On the whole, a child could not go to school for 4.1 days due to an episode of malaria and in severe malaria cases, a child lost up to 5.4 days from school compared to 3.4 days in mild malaria (see Table 8). An urban school child lost on average more days than a school child from the rural area. The long-term implications in terms of productivity losses to the households due to school absenteeism is difficult to measure and is not considered in this paper, but frequent absenteeism from school could have adverse effects on pupils'/students' academic performance in the short term and a long term impact on their future employment opportunities.

6.1.6 Household assets (wealth)

Information on the state of a household is an important consideration of the economic well-being of the individuals in the household. In the survey, 48% of household homes were made of thatch and mud, which often requires reconstruction and the outlay of money after each rainy season.

In general, the population of the district owned a low percentage of household assets. A negligible percentage (0.5%) of households owned electric stoves and only 5 out of 423 households had gas stoves. One percent of rural households owned a fridge compared to 15% of urban household and 21% of rural household owned a sewing machine compared to 44% of urban households (see Table 9). Aluminum pans are the most common utensils and are used by 85% of households.

Table 9: Assets of households (n = 423)

Asset	*Location*	*frequency*	*Percentage*
Electric stove	*Rural*	0	0
	Urban	2	2
Gas stove	*Rural*	1	0.3
	Urban	4	3
Fridge	*Rural*	4	1
	Urban	16	14
TV	*Rural*	12	4
	Urban	18	15
Sewing machine	*Rural*	64	21
	Urban	51	44
Beds	*Rural*	171	56
	Urban	98	84
Coalpots/kerosene stoves	*Rural*	204	67
	Urban	103	88
Electric lamps	*Rural*	5	2
	Urban	6	5
Kerosene lamp	*Rural*	294	96
	Urban	107	91
Motor vehicles (cars, tractors, motor bike)	*Rural*	12	4
	Urban	12	10
Bicycles	*Rural*	212	69
	Urban	84	72

The most common means of transport especially in rural Ghana was the bicycle. In the survey, 70% of the households owned a bicycle, and 20% of them owned between 2 and 3 bicycles.

6.1.7 Household consumption expenditure

The survey obtained information on household consumption expenditure. Total annual expenditure for the year was calculated by multiplying monthly expenditure by twelve assuming equal expenditures. The estimation of the expenditures is necessary in order to obtain the proportion of household total expenditure accounted for by costs associated with a malaria episode. Table 10 below shows the mean annual consumption expenditures, per capita annual expenditure and the percentage of annual expenditure associated with a malaria episode. The mean annual expenditure amongst rural households of ¢917,197 ($244.59) was less than half of the mean annual expenditure amongst urban households. The staggering differences in consumption expenditure could be due to the massive celebrations resulting in more expenditures during the Christmas and New Year celebrations, which was more peculiar in urban than in the rural areas. The mean annual expenditure for the district was ¢1,235,040 ($329.34) (see Table 10).

Table 10: Annual consumption expenditure

Variable	Location	Mean	Per capita mean ACE*	% of malaria cost
Expenditures	Rural	¢917,197 ($244.59)	571 ($0.15)	43.2
	Urban	¢2,039,158 ($543.78)	3268 ($0.87)	25.2
	Combined	¢1,235,040 ($329.34)	554 ($0.15)	34.8

* ACE: Annual consumption expenditure

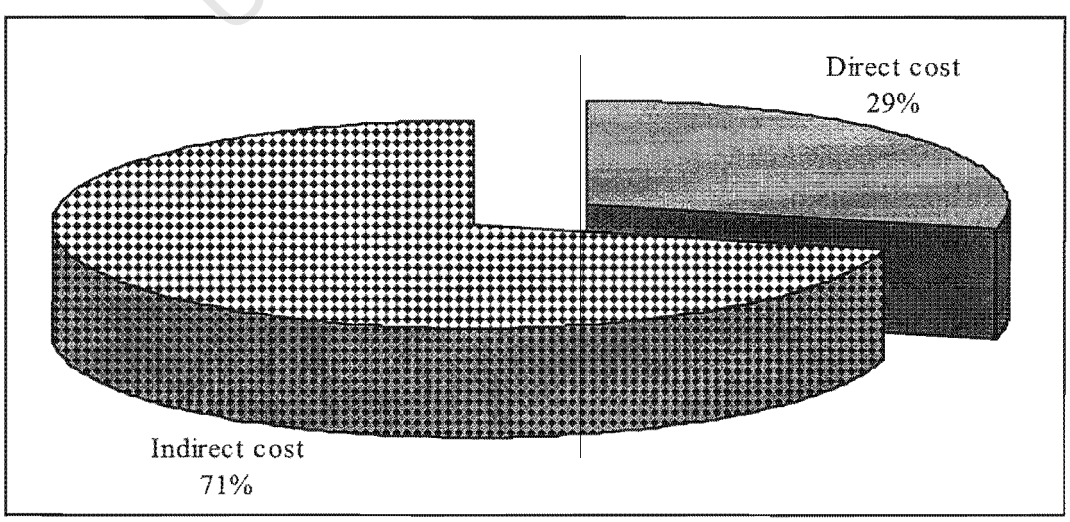
6.2 Economic cost of malaria

This section presents the estimated results of direct and indirect costs of malaria care. First, the total cost (direct and indirect) with reference to location and severity is presented in 6.2.1. Secondly, the detail results of direct and indirect costs by location and severity are indicated in 6.2.2 and 6.2.3 respectively.

6.2.1 Total cost with reference to location and severity

The overall total cost in terms of location and severity were estimated as ¢14,909,925 ($3,975.98) and ¢14,728,740 ($3,927.67) respectively. Total cost (in terms of location) per case and per household were ¢24,244 ($6.47) and ¢35,248 ($9.40). With regard to severity, the total cost per case and per household were ¢23,950 ($6.39) and ¢34,820 ($9.29) respectively. The overall results in terms of location and severity do not differ significantly from each other. In both situations indirect cost was 71% of the total cost of seeking malaria care (see Figure 13) and this is consistent with existing literature (Shepard *et al.* 1991; Ettling et al. 1994; Assenso-Okyere and Dzator 1996).

Figure 7: Proportion of direct and indirect cost of malaria care



Given the daily agricultural wage rate (forgone earnings) for men and women as ¢4,500 ($1.20) and ¢4,000 ($1.07) respectively, the average cost of malaria to a household in the district can then be translated into 7.7 man days (male working days) or 8.7 woman days (female working days). This is an enormous loss of productivity to individuals and households. The results are consistent with a study in Solenzo, Burkina Faso which estimated a lost of 9 adult working days to a household due to malaria (Sauerborn *et al.* 1991).

6.2.2 Direct cost

The direct costs were estimated in terms of location and severity.

6.2.2.1 Direct cost by location

The total direct cost of seeking malaria care was estimated at ¢4,313,800 ($1,150.35) (see Table 11). A malaria case from the rural area cost ¢6,701 ($1.79), which was slightly lower than the urban area of ¢7,822 ($2.09). At the household level, the average direct cost of malaria to rural communities was ¢9,701 ($2.59) which was slightly lower than the urban area of ¢11,498 ($3.07). Table 11 summarises the direct cost of malaria by location

Table 11: Direct cost of malaria by location

	Rural	Urban	C'bined**
Total direct cost of malaria care	¢2,968,500 **$791.60**	¢1,345,300 **$358.75**	¢43,13,800 **$1150.35**
Direct cost per case	¢6,701 **$1.79**	¢7,822 **$2.09**	¢7,014 **$1.87**
Direct cost per household	¢9,701 **$2.59**	¢11,498 **$3.07**	¢10,170 **$2.71**

** The study area (combined rural and urban areas)

6.2.2.2 Direct cost by severity

As in the case of location, total direct cost of seeking malaria care for all study population for the period was estimated to be ¢4,313,800 ($1,150.35). A case of severe malaria cost ¢11,182 ($2.98) compared to only ¢5,317 ($1.42) on mild malaria (see Table 12). Households spent more than twice as much in severe malaria than with mild malaria care. Table 12 summarises the total direct cost of malaria episode, total direct cost per case and per household by severity. It is evident from the table that, while direct cost of seeking mild malaria care per household was ¢7,744 ($2.07), the direct cost of severe malaria was as much as ¢16,183 ($4.32) (see Table 12).

Table 12: Direct cost of malaria by severity

	Severe	Mild	C'bined
Total direct cost of malaria care	¢1,990,450 **$530.79**	¢2,323,350 **$619.56**	¢4,313,800 **$1,150.35**
Direct cost per case	¢11,182 **$2.98**	¢5,317 **$1.42**	¢7,014 **$1.87**
Direct cost per household	¢16,183 **$4.32**	¢7,744 **$2.07**	¢10,170 **$2.71**

6.2.3 Indirect cost

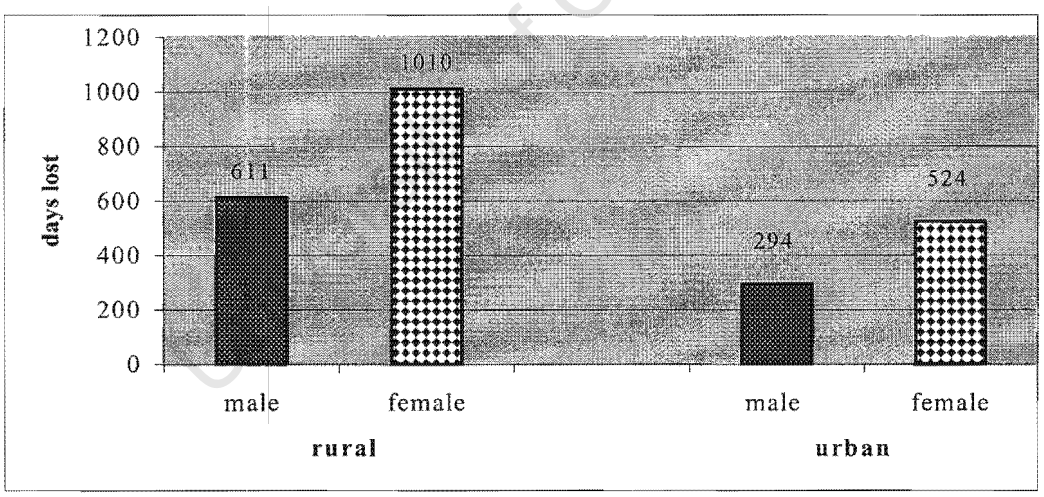
As in the case of direct cost, the estimated results of indirect cost of malaria care are presented in terms of location and severity.

6.2.3.1 Indirect cost by location

6.2.3.1.1 Time lost

The opportunity cost of time lost was considered with regard to the days that an economically active person lost due to an episode of malaria as well as time lost (waiting time) to see a health worker. The research considered economically active persons of age 18 to 60 years of malaria patients and caretakers as well as children (not in school) between the ages of 12 and 17 years. Children between the ages of 12 and 17 years were assumed to earn half of the daily wage of an adult as noted in the methodology. Figure 7 depicts the number of adult malaria cases and caretakers in terms of men and women and by location.

Figure 8: Days lost from productivity by location



As indicated earlier, women dominated the adult malaria cases and caretakers in both rural and urban areas. The study revealed a total of 264 adult malaria cases and 411 caretakers. Together, there were 675 adult malaria cases and caretakers of which 68% were reported from the rural area. A total of 2,439 days were lost from productive

activities by the adult malaria cases and caretakers. Of the number of days lost, 66% were reported from the rural area.

The number of cases for the age group of 12 and 17 was 31, of which 17 were reported from the rural area and 14 from the urban area. The 31 cases lost a total of 101 days, out of which 58% were reported from the rural area. The number of cases within this age group represented 5% of the total number of malaria cases and these were not in school at the time of the survey. Out of the number of days lost by this age group, 58% were due to severe malaria.

With regard to waiting time, a total of 16,183 minutes (270 hours) of both adult and children were lost due to waiting to see a health worker. Out of this 67% were attributed to rural malaria cases.

6.2.3.1.2 Value of time lost

The total value of days lost from productivity was estimated by multiplying the prevailing daily average agricultural wage by total number of days lost by both adults and children between the ages of 12 and 17. The total value of all the days lost for adults (patients and caretakers) was ¢10,208,500 ($2,722.27), made up of ¢6,789,500 ($1,810.53) rural and ¢3,419,000 ($911.73) urban. The total value of days lost by the children between the ages of 12 and 17 was estimated to be ¢214,250 ($57.13) also made up of ¢101,750 ($27.13) rural and ¢112,500 ($30) urban.

Total waiting time was valued based on the assumption that people work for eight hours a day in the district, which implies men and women earned ¢563 ($0.15) and ¢500 ($0.13) per hour respectively. The total value of waiting time was ¢143,375 ($38.24), of which 67% was reported from the rural area.

Table 13 illustrates the indirect cost of malaria episode by location in terms of total indirect cost, total indirect cost per case and per household. Altogether (days lost and waiting time), the total value of time lost to productive activities due to malaria was estimated at ¢10,596,125 ($2,825.63) made up of ¢7,017,798 ($1871.41) rural and ¢3,578,327 ($954.22) of urban (see Table 13).

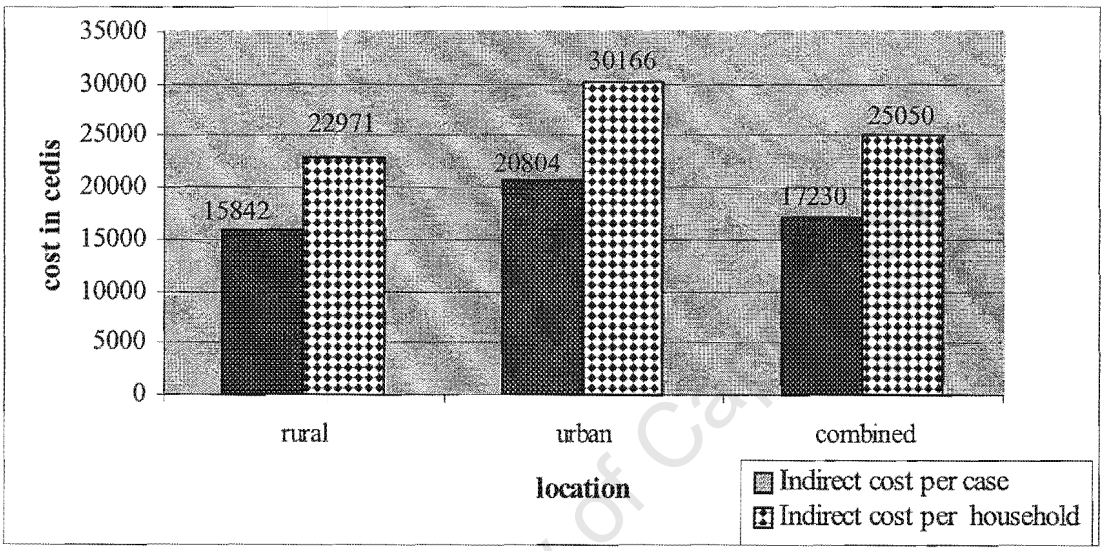
Table 13: Indirect cost of malaria episode by location

cost	Rural	Urban	C'bined
Total indirect cost	¢7,017,798 **$1,871.41**	¢3,578,327 **$954.22**	¢10,596,125 **$2,825.63**
Indirect cost per case	¢15,842 **$4.22**	¢20,804 **$5.55**	¢117,230 **$4.60**
Indirect cost per household	¢22,971 **$6.12**	¢30,166 **$8.04**	¢25,050 **$6.68**

From the value of time and given the number of malaria cases, the estimated indirect cost per a case of malaria for the rural area was ¢15,842 ($4.22), which was lower than the urban indirect cost per case of ¢20,804 ($5.55). As revealed earlier in this study, there were on average 1.45 malaria cases per household, thus, the estimated indirect cost per household in the rural area was ¢22,971 ($6.12), which again was lower than the urban indirect cost of ¢30,166 ($8.04). Figure 8 graphically depicts the indirect cost per case

and per household by location. It is evident from Figure 8 that urban households incurred higher indirect cost in malaria than rural households. In both areas, indirect cost could pose enormous negative impact on households' productivity and income.

Figure 9: Indirect cost per case and per household by location



6.2.3.2 Indirect cost by severity

6.2.3.2.1 Time lost

Out of the 675 adult malaria cases and caretakers, 225 were severe malaria and 450 mild malaria. The total number of days lost from productive activities were 2,439 by the 675 (adult malaria and caretakers). Of the total number of days lost, 55% were due to severe malaria (see Figure 9).

Figure 10: Days lost from productivity by severity

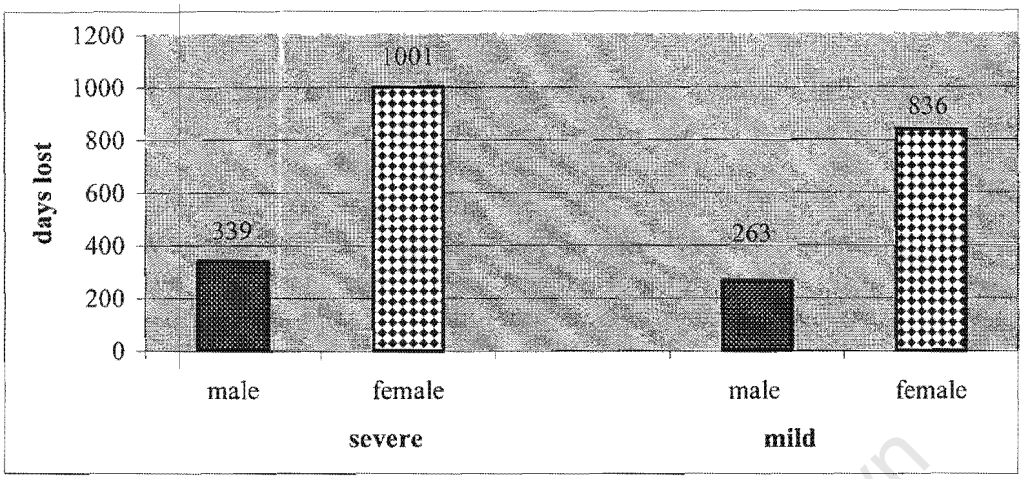


Figure 9 provides a summary of the days lost by adult malaria cases and caretakers due to malaria by gender and severity. Again, more women lost more productive days than men, which follows from the fact that more women are in the role of caretaking to malaria patients, especially in the case of children.

Of the 31 cases of children (not in school) between the ages of 12 and 17, 32% were due to severe malaria. Of the 101 days lost by this age group, 54% was attributed to severe malaria.

With regard to waiting time, out of the total waiting time of 16,183 minutes (270 hours), only 29% was attributed to severe malaria. However, the mean waiting time was 26 minutes and ranged from 5 to 600 minutes. The mean waiting time was the same for both severe and mild malaria.

6.2.3.2.2 Value of time lost

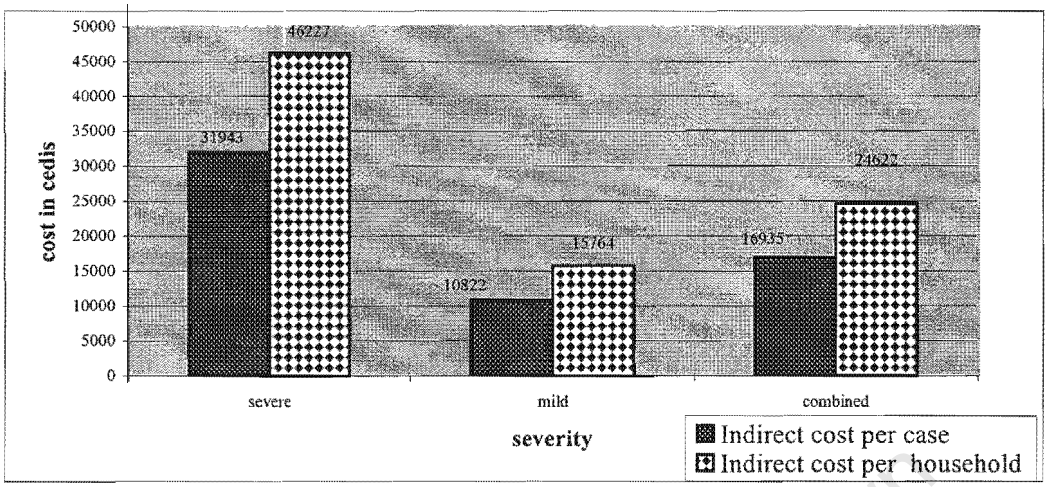
The value of days lost from productivity due to malaria was estimated as ¢8,992,000 ($2,397.87), of which 62% was due to severe malaria. Sixty-one percent of the value of days lost from productively was due to caretaking, which is mostly undertaken by women. Women also bore a comparatively higher indirect cost associated with severe and mild malaria than men and this resulted from the fact that they lost more productive days than men. The total value of days lost by children (not in school) between age 12 and 17 was estimated at ¢214,250 ($57.13). Out of this figure, ¢114,500 ($30.53) was due to severe malaria and ¢99,750 ($26.6) of mild malaria. The total value of waiting time was ¢143,690 ($38.32), of which 33% was due to severe malaria (see Table 14).

Table 14: Indirect cost of malaria episode by severity

cost	Severe	Mild	C'bined
Total indirect cost	¢5,685,894 **$1,516.24**	¢4,729,046 **$1,261.08**	¢10,414,940 **$2,777.32**
Indirect cost per case	¢31,943 **$8.52**	¢10,822 **$2.89**	¢16,935 **$4.52**
Indirect cost per household	¢46,227 **$12.33**	¢15,764 **$4.20**	¢24,622 **$6.57**

Taking days lost and waiting time, the total value of time lost to productivity was estimated to be ¢10,414,940 ($2,777.32), of which 55% was due to severe malaria care. Given the value of time, the total value of time and number of malaria cases, the estimated indirect cost of a severe malaria case was ¢31,943 ($8.52) compared to ¢10,822 ($2.89) of mild malaria care. At the household level indirect cost of severe malaria per household was ¢46,227 ($12.33) and ¢15,764 ($4.20) of mild malaria per household (see Figure 10).

Figure 11: Indirect cost per case and per household by severity



6.2.4 Total cost of malaria

6.2.4.1 Total cost of malaria by location

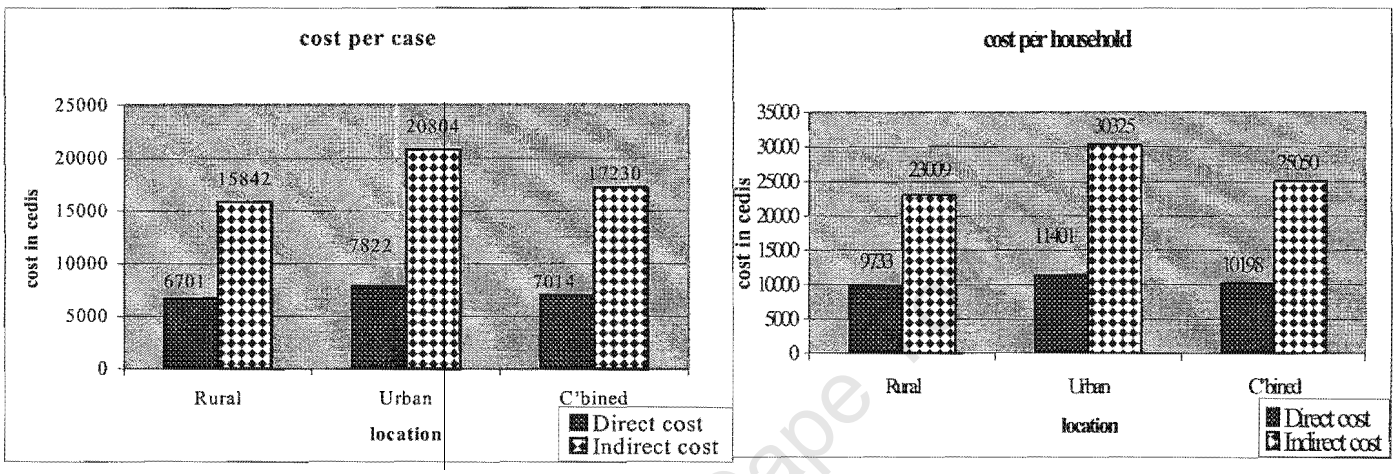
Table 15 summarizes both indirect and direct costs in seeking care for malaria in terms of location. Total direct cost was estimated as ¢4,313,800 ($1,150.35) compared to total indirect cost of ¢10,596,125 ($2,825.63). Amongst both rural and urban households indirect cost far exceed direct cost (see Table 15).

Table 15: Total cost by location

cost		Rural	Urban	C'bined
Direct cost		¢2,968,500	¢1,345,300	¢4,313,800
		$791.60	**$358.75**	**$1,150.35**
Indirect cost		¢7,017,798	¢3,578,327	¢10,596,125
		$1,871.41	**$954.22**	**$2,825.63**
Total cost		¢9,986,298	¢4,923,627	¢14,909,925
		$2,663.01	**$1,312.97**	**$3,975.98**

Figure 11 gives a pictorial illustration of the location difference of direct and indirect cost of malaria per case and per household. The figure revealed that urban households suffer a higher direct and indirect cost of malaria than rural households.

Figure 12: Total cost of malaria care by location



The total direct cost per case and per household were ¢7,014 ($1.87) and ¢10,170 ($2.71) compared to the indirect cost per case and per household of ¢17230 ($4.60) and ¢25050 ($6.68) respectively, which further emphasised the high proportion of indirect cost over direct cost of malaria care in the district.

6.2.3.2 Total cost of malaria by severity

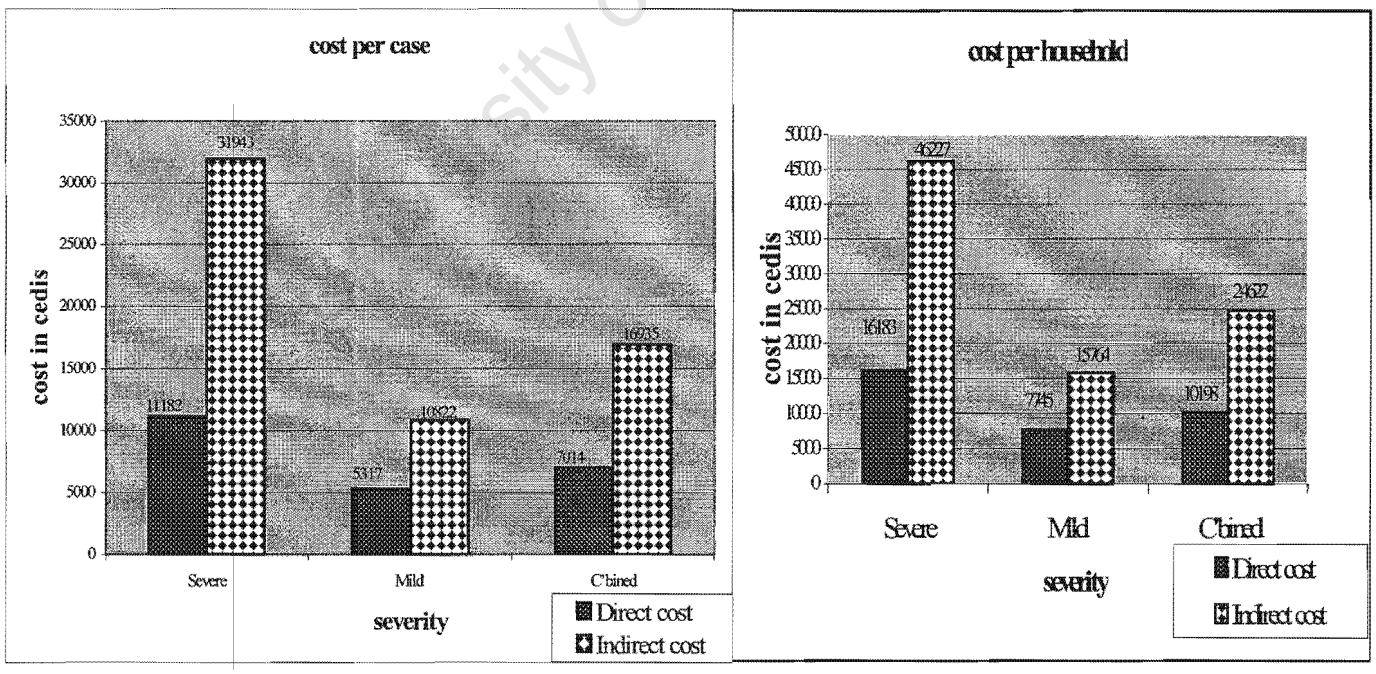
Table 16 summarises the direct, indirect and total cost of malaria episode by severity. In terms of severity (i.e. severe and mild malaria), total direct cost was ¢4,313,800 ($1,150.36) compared to indirect cost of ¢10,414,940 ($2,777.32). The total direct cost in severe malaria was ¢1,990,450 ($530.79) and mild malaria was ¢2,323,360 ($619.56). The total indirect cost was ¢5,685,894 ($1,516.24) for severe malaria and ¢4,729,046 ($1,261.08) for mild malaria.

Table 16: Total cost by severity

Cost	Severe	Mild	C'bined
Direct cost	¢1,990,450 **$530.79**	¢2,323,360 **$619.56**	¢4,313,800 **$1,150.35**
Indirect cost	¢5,685,894 **$1,516.24**	¢4,729,046 **$1,261.08**	¢10,414,940 **$2,777.32**
Total cost	¢7,676,344 **$2,047.03**	¢7,052,406 **$1,880.64**	¢14,728,740 **$3,927.67**

Figure 12 below also depicts the severity difference in direct and indirect cost of malaria care per case and per household. In both direct and indirect cost of malaria care, severe malaria cost was exorbitantly higher than mild malaria. Cost associated with severe malaria is more than twice that of mild malaria (see Figure 12).

Figure 13: Total cost of malaria care by severity



The Total direct cost (irrespective of severity) per case and per household were ¢7,014 ($1.87) and ¢10,198 ($2.72) compared to indirect cost per case and per household of ¢16,935 ($4.52) and ¢24,622 ($6.56) respectively.

6.2.4 Malaria cost as a percentage of total annual expenditure

Table 17 depicts the household occasional and basic expenditure. Perhaps it is important to bear in mind that these data were collected a month after the Christmas and New Year (2000 jubilee) celebrations and also coincided with the time of traditional festivities in the district. Hence the figures reported may have been higher than under normal times.

In general, 13.5% of households' expenditure was on occasional expenditures such as clothing and wares, utilities, education and funeral celebrations/drinks and colanuts. Household expenditure on healthcare was as high as 10.8% of annual expenditure, which is favourably at par with World Bank estimates of household expenditure on healthcare. Close to half (47.7%) of annual household expenditure was on food and 4.6% was spent on capital goods such as motorbikes, bicycle, and zinc among others.

The survey revealed an average of 1.45 malaria cases per household for the one-month period and this cost (direct and indirect) a household on average ¢35,250 ($9.40), which represented 2.9% of total annual expenditure per household. This is perhaps substantial if we consider the fact that total annual expenditure on health was just 10.8%. Given the share of health expenditure of 10.8%, the cost of malaria for just a month was 26.6% of the annual household healthcare expenditure. This may be a substantial burden to

households if we consider the fact that malaria is but one of the many health problems in the district.

Table 17: Household basic and occasional expenditure by location

Item (basic and occasional)	Annualized mean expenditure			% of total expenditure		
	Rural	Urban	Total	Rural	Urban	Total
Food	¢413,913.16 ($110.38)	¢763,514.32 ($203.60)	¢588,713.74 ($156.99)	45.1	37.4	47.7
Clothing and wares	¢47,929.93 ($12.78)	¢90,335.88 ($24.09)	¢60,071.79 ($16.02)	5.2	4.4	4.9
Health care	¢89,140.56 ($23.78)	¢176,400 ($47.04)	¢132,770.28 ($35.41)	9.7	8.7	10.8
Malaria **	**¢32742 ($8.73)**	**¢41726 ($11.13)**	**¢35250 ($9.40)**	**3.6**	**2.1**	**2.9**
Utilities	¢3,102.08 ($ 38.27)	¢90,186.67 ($24.05)	¢51,378.95 ($13.70)	0.3	4.4	4.2
Education	¢22,842.74 ($6.09)	¢63,530.61 ($16.94)	¢34,912.20 ($9.31)	2.5	3.1	2.8
Capital goods	¢28,243.40 ($7.53)	¢101,242.40 (27.00)	¢56,254.65 (15.00)	3.1	5.0	4.6
Family celebrations/ drinks/colanuts etc.	¢24,747.86 ($6.59)	¢39,516.13 ($10.54)	¢19,238.01 ($8.56)	2.7	1.9	1.6
Other expenditures (buildings, marriages etc)	¢254,535.27 ($67.88)	¢672,705.99 ($179.39)	¢256,450.38 ($68.39)	27.8	33	20.5

** Cost of seeking malaria care for one-month period.

Table 17 also shows the locational differences in the percentage of the various basic and occasional expenditures. Except for expenditures on utilities, education and capital goods, households in rural area spend higher percentages of their annual incomes on food, clothing, health and funeral and household festivities than urban areas.

Rural dwellers also spent a higher percentage of their income on food, funerals and household festivities and healthcare than their urban counterparts. Due to the subsistence nature of rural life, efforts are often channel to ensure food security for bigger household size.

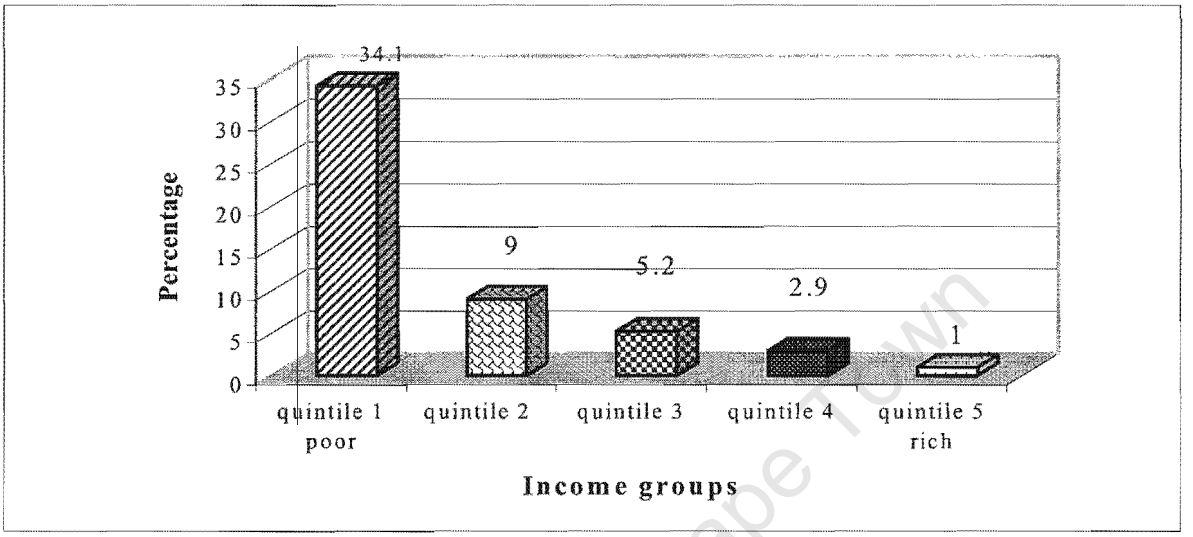
On healthcare, even though the mean absolute mean annual consumption expenditure of rural households was less than half that of urban households, rural households spend a higher proportion of their income on health care than urban households. This may be due to the fact that urban households spend more on other goods (e.g. education, fridge etc) which are equally essential for the production and maintenance of good health. On malaria cost, even though, rural households have a lower average cost of malaria but they spend a higher percentage (3.6%) of income on malaria cost (for a month) than urban households (2.1%). The cost of malaria is substantial proportion of household incomes and poses a burden on households, but this burden is more on rural than urban households in the district (see Table 17).

6.2.4.1 Malaria cost to households as percentage of annual expenditure by quintiles

Figure 14, depicts the cost of malaria to households as a percentage of total annual household expenditure by income quintile, given that, the mean malaria cost was ¢35,250 ($9.40) for the district. The mean annual income of the bottom poor (quintile 1) was estimated at ¢103,631.52 ($27.60) compared to the top rich quintile of mean annual income of ¢3,669,099.61 ($978.43). Consequently, the cost of malaria was as much as

34.1% of the total annual household expenditure of the bottom 20% (quintile 1), but only 1% of the total annual expenditure of the top 20% (quintile 5) (see Figure 14).

Figure 14: Mean malaria cost as a percentage of annual expenditure by quintiles



*Percentage of cost of malaria to household as a proportion of mean annual expenditure.

The findings support earlier assertions that the burden of malaria in terms of cost fall on the rural poor. However the brunt of malaria cost fall more on the poorest of the poor, bottom 20% of the people who have very limited income (Sharma *et al.* 1990; Guiguemde *et al.* 1994; Koradsen *et al.* 1997).

Chapter Seven

DISCUSSION

7 Introduction

This chapter discusses the results presented in the previous chapter. This discussion is an evaluation of the extent to which the research aim and objectives have been realised.

7.1 Factors influencing malaria health care

Ghana has a fairly high illiteracy rate (GMTHS 1995). The study clearly revealed that, 60% of the household heads were illiterate. As Mwabu (1986) noted, the education of household heads impacts on the health care and other decision-making process of the households. As such, the high illiteracy rate among household heads in the district may have negative implications on the choice of malaria care and more importantly the timeous response to malaria treatment. In the study it was found that patients who sought treatment from private providers; drug peddlers and traditional healers were more often from households headed by people with little or no education. Though this relationship was not so definite, but reducing adult illiteracy through effective non-formal education programmes might have a positive influence on people's choice and response to treatment.

7.2 Malaria care

Thirty percent of the malaria cases were children between age 0 and 5. This is to be expected as malaria has been found to be pervasive in children in the district (Binka *et al.*

1997). It was therefore not surprising that 76% of the malaria cases had caretakers and who were mostly (66%) women. More worrying is the fact that 43% and 96% of malaria patients and caretakers were the cream of the economically active population of the area. The fact that women bear a brunt of malaria means their reduced engagement in domestic and other economic activities that they tend to engage in. A reduction in household ability to generate income has several implications, which results in the reduced ability of such households to demand enough goods and services for the maintenance of good health. Public education on early treatment and preventive measures need to be directed to women who are found to bear the brunt of malaria.

The majority of malaria cases sought care. As Assenso-Okyere and Dzator (1996) noted, the disease is so debilitating that people tend to seek care whether it was mild or severe. Another reason for the high percentage of those sought care could be due to the presence of a community health and family planning study (new system of community health service delivery)[15] currently conducted in the district. As such, community health workers are easily accessible at any time to those who need health care. It was not therefore surprising that most (68%) malaria patients sought modern care. Drug peddlers were also sources of health care by malaria patients and caretakers.

Private providers continue to play a key role in the provision of healthcare services to rural communities. Eighteen percent of the malaria cases received treatment from drug

[15] In this method of health service delivery, community health nurses and village health volunteers have been trained and deployed throughout the communities to provide basic but pertinent health care and family planning services.

peddlers. A concern regarding drug peddlers are that, they are often not adequately trained and in instances provide expired drugs and more often than not do fail to advise patients on the recommended dosage (Shepard *et al.* 1990). The consequence of their activities are great since this may lead to drug resistance and repeated attacks of the diseases leading to increases in direct expenditures and the number of days lost. Integrating their services formally into the health sector stream would go a long way to improving diagnosis and treatment of malaria and other diseases.

The study revealed that 91% of households engaged in free-range toilets. This poses a great health hazard, including the breeding of mosquitoes leading to increases in the incidence of malaria. Increases in malaria incidence may translate into more costs and loss of days to productive activities. To reduce the cost of malaria to households, there is the need for public education on the proper management of human waste disposal. This calls for better and improved co-ordination between various stakeholders and interest groups (K-N district Assembly, the Ministry of Environment Science and Technology, Ministry of Health, NGOs, etc.) to provide the necessary assistance to solve the problem of indiscriminate human waste disposal in the district.

7.3 Direct and indirect costs of malaria

Most cost analysis consider only institutional services cost (e.g. Cohn 1973; Creese and Henderson 1980; WHO 1988), for which data is more readily available than individual, household or community costs. Such approaches overlook equally important costs, which fall outside the institutional service costs. This study attempted to identify and quantify

these costs, thereby highlighting the importance of this, in research of the costs of malaria.

Among the components of direct cost estimated in the previous chapter, special food (46%) and drugs (45.7%) were the major components of direct cost. Together, they make up to 91.7% of total direct cost of malaria care in the district. The reason for the high proportion of special food could be due the erroneous perception (30%) in the district that bad food causes malaria (Owusu *et al.* 1997). The high percentage of drug costs could also be explained in terms of the existing user fees where Government seeks to recover the full cost of drugs. Transport cost was only 3.1% of total direct cost, this was expected as the common means of transport was the bicycle and only 5% of patients and caretakers used public transport to seek care. The relatively low proportion of consultation and diagnostic cost could also be due to the fact that 80% of malaria cases sought health care from primary level facilities where these services are almost free.

For a month, a total of 423 study households spent a total of ¢4,313,800 ($1,150.35) as out-of-pocket expenditure (direct cost) on malaria care. The average direct cost being ¢10,170 ($2.71) per household. Assuming a constant monthly direct expenditure on seeking malaria care in a year, a household stands to incur a total annual direct cost of ¢122,040 ($32.54). This is an enormous burden on households considering the fact that direct cost is only 26% of the total cost of malaria care. This cost implies that very poor households (bottom 20%) would spend 17.9% more than their annual total income and may even have to borrow money to finance the cost of malaria care. This poses a

significant burden on households, considering that malaria is, only one of the numerous health problems in the district.

In the literature, each non-fatal malaria episode is associated with between 5 to 20 days of disability (Van Dine 1916; Russell and Menon 1942; Malik 1966; Conly 1975; Najera *et al.* 1993). The study found 5.2 days as the average duration for a non-fatal malaria episode. This was consistent with Mills' (1991) argument that an average of 5 days of malaria disability per a non-fatal malaria episode was more realistic. However an adult malaria case or a caretaker could not work or go about his/her normal activities for an average of 5.3 and 2.3 days in severe and mild malaria, respectively. This reduces the time spent on productive pursuits (Ettling and Shepard 1991; Shepard *et al* 1991).

Long waiting time at health institutions has often been a phenomenon in many developing countries. In this study, it was found that patients often waited up to six hours to see a health worker. The mean waiting time in this study across providers was however 26 minutes. This relatively low waiting time was probably due to the presence of the community health workers and the fact that many also sought malaria care from the numerous drug peddlers and chemist shops, which have sprung up following government's economic and trade liberalization policies.

However more worrying was the fact the mean waiting time for both severe and mild malaria cases was the same (26 minutes). It was found that a severe malaria case could even wait up to 3 hours to see a health provider. The implications of this are grave, since

obviously delays in attending to severe malaria cases may result in increased complications requiring more sophisticated treatment and possibly admissions. This increases the cost of treatment and the value of lost time, which may tend to adversely affect household budgets and consumption. Long waiting time of those with severe malaria may even result in fatality. There is the need for prompt attention to, and treatment of severe malaria cases at health facilities. This may help reduce cost of malaria episodes and even reduce fatal malaria cases.

On the whole, a total time of 2,439 days were lost to productive pursuits by malaria patients and caretakers and this yielded a potential financial value of ¢10,596,125 ($2,825.63), which is 71% of the total cost of seeking malaria. On average, a household lost ¢35,248 ($9.40) as indirect cost to malaria. In terms of severity, there was a remarkable difference in cost between mild malaria [¢10,822 ($2.89)] and severe malaria [¢31,943 ($8.52)]. This remarkable difference is evident and intuitive, as malaria patients and caretakers spent more days out of work in severe than in mild malaria cases. On the basis of data collection, it was estimated that a household stands to lose an average of ¢423,000 ($112.8) per annum, which is an enormous potential income lost to households. This reduces the consumption of other health and non-health goods and may affect the production and maintenance of good health, which is essential for productivity. Unfortunately, this enormous component of cost (i.e. indirect cost) is often overlooked by individual, households and even health providers, since it does not involve direct cash payment.

Combining direct and indirect costs, we obtained a total cost in terms severity as ¢14,728,740 ($3,927.67), which yielded a cost per case and per household as ¢23,949 ($6.39) and ¢34,820 ($9.29) respectively. These results are not too different considering the costs in term of location. In both situations, indirect cost was 71% percentage of the total cost of malaria care and this is consistent with existing literature. Kaewthsonthi *et al.* (1989) found indirect cost in Thailand to be over 70% of total cost of malaria care. The average total cost per a malaria case of ¢23,949 ($6.39) compares favourably with the estimate from Sauerborn *et al.* (1991) who obtained $5.96 as total cost per case in Solenzo-Burkina Faso. The figure ¢23,949 ($6.39) was however lower than the estimate from Shepard *et al.* (1991) who obtained the total cost per case of malaria or fever for Africa to be $9.84 (in 1987 US Dollars).

Essentially, resources could be saved if malaria is promptly diagnosed and treated. This is so given the fact that a household incurs a cost of ¢62,409 ($16.64) in seeking care for a severe malaria compared to only ¢23,508 ($6.27) for a mild malaria. Early treatment would avoid the disease developing into a severe state and thus leading to higher costs, in terms of both costs of seeking care and days lost to production. Such resources could then be redirected to other commodities essential for maintaining the sustainability and well-being of the households. To ensure this, intensive health education using visual aids in the form of dramas may help to illustrate the need and benefit of early treatment of the disease. Dramas have frequently and successfully been used by NHRC and other NGOs for various programmes in the district.

A look at rural and urban differences in term of direct and indirect costs revealed that, even though total cost of malaria care from the rural far exceed urban cost, urban households incurred higher average cost of ¢41,726 ($11.13) compared to ¢32,314 ($8.73) of rural households. The results are as expected since urban households tend to buy more expensive drugs than their rural counterparts. However, the lack of major differences in the cost can be explained by the homogeneity of the district (Binka *et al.* 1997).

It has also been revealed that school pupils/students lost on average 4.1 days from school due to malaria. In a severe malaria case, a school pupil/student lost up to 5.4 days which may adversely affect school attendance. Kere *et al.* (1992) found a similar trend in the Solomon Islands. The statistics are quite disturbing since absenteeism from school could affect a child's academic performance. Perhaps, effective health education in schools on preventive measures and the need for an early response to treatment of the disease may reduce the prevalence, leading to a reduction in the overall cost. This calls for the collaboration of the Ministry of Education and Health to jointly design an effective health education programme in schools, with emphasis on malaria since it is the most prevalent disease in the country and the district in particular.

ITN has found to be an effective prevention of malaria in the district (Binka *et al.* 1997). The current cost of the ITN in the district is about ¢18,750 ($5.00) and has a life span of five years. The findings of the study reveals that buying an ITN may be far more beneficial to households in terms of saving resources than the associated monthly malaria

cost of ¢35,248 ($9.40). The needs and benefits of prevention and early treatment would have to be clearly explained to the communities for them to judge prevention and treatment cost options and to be able to make informed decisions on seeking care for malaria. Highlighting the direct and indirect cost to communities and the gain that ITNs have, may help to further promote the use of ITNs in the area. In large randomised control trials in endemic countries, ITNs have shown reductions in clinical episodes of malaria, high-density parasitaemias, incidence and prevalence of malaria and in K-N district, ITNs have showed a 17% reduction in all cause mortality in children under five (Binka *et al.* 1996).

The majority of the people of the K-N district are poor, with very low expenditures and household assets. These households spend approximately 1/3 of their annual income on seeking care for malaria. The critical question, which arises is, which commodities are being sacrificed? If households are to meet the cost of malaria for a whole year, it often means them sacrificing the consumption of other goods, many of which are essential (e.g. food, education etc.). Food is so basic and due to the implications of poor nutrition on health, it may not be possible to sacrifice the consumption of food. All other goods, such as clothing and education among others, are equally crucial inputs for the production of good health. The exorbitant cost of malaria is thus a burden, particularly on poor households and threatens their consumption of equally important health and non-healthcare goods.

Poverty may affect the demand for prevention and early treatment of malaria. Laudable ideas to reduce the economic cost of malaria on households need to go hand in hand with programmes to alleviate the poverty of households. Poor households may accept the noble ideas of early response to treatment and the benefit of buying ITNs in order to reduce the economic cost of malaria; however, such households need some income to meet even the lowest cost of early treatment and ITNs. There is the need for government in collaboration with NGOs to economically empower households especially women (both as cases and as caretakers) to enable them effectively demand health care including malaria care. Such economic empowerment could include small-scale poverty alleviation programmes (e.g. sheanut extractions, dressmaking, small-scale irrigation farming, etc) to enable them access to income for health care particularly malaria care.

Chapter Eight

CONCLUSION AND RECOMMENDATIONS

This chapter concludes and recommends policies based on the findings of the study. The chapter concludes with suggestions for further research.

8.1 Conclusion

Perhaps the most significant and least examined impact of malaria is its economic impact on individuals and households (Ettling *et al.* 1994). The paper has therefore attempted to estimate the cost of seeking malaria care to households in northern Ghana. Apart from direct out-of-pocket payment, the opportunity cost of time was also estimated, using a recall period of one month.

Among the components of direct cost, drugs and special food accounted for over 90% of the total direct cost. Special food accounted for quite a high percentage of direct cost, which may be as a result of the perception that bad food causes malaria in the district. Communities and households do not fully understand the link between the mosquito and malaria in the district and so improved public education would be required to inform people about the proper cause of malaria (the anopheles mosquito). This may have a positive impact on the use of ITNs in preventing malaria. Drugs also accounted a significant percent of the total direct cost of seeking malaria care. This proportion is expected to rise in the future as *P. Falciparum* chloroquine resistance increases, requiring more potent and expensive drugs than chloroquine.

The study revealed that both direct and indirect cost costs associated with malaria episode are very substantial burden to households. The indirect cost of malaria which result from lost of time due to malaria was found to far outweigh direct cost of malaria. The proportion of indirect cost to the total cost of malaria was as much as 71%, which is quite substantial. As mentioned earlier, early treatment and the use of prevention measures for malaria could reduced the amount of time lost in malaria care and which could result in a reduction in indirect cost.

Together (indirect and direct), malaria cost a household a significantly amount of household income, which is quite substantial considering the low incomes of households in the area. The average cost of seeking malaria care including direct cost, opportunity cost of days lost from productive pursuits, and waiting time translated into several days of male or female output. These losses are an enormous cost to the productivity of households and could impact negatively on households' budgets. To reduce the waiting time at health facilities, especially with formal health facilities, it would be necessary to re-organise the health operations of the health care providers to ensure that all activities are expedited in order to avoid unnecessary waiting time.

To reduce the cost of the disease, public education should be intensified so that early signs of the disease are reported to healthcare providers before it becomes severe and therefore more expensive. As noted earlier there is the need to integrate the activities of the private practitioners (i.e. drug peddlers and traditionalists or herbalists) into the main

health care stream. This would avoid incorrect diagnoses and prescriptions, which can be dangerous and might even be fatal.

The study revealed that very low-income households carried a disproportionate share of the economic burden of malaria. As the proportion of malaria cost to annual expenditure was 34.1% of poor households compared to only 1% of rich households. There thus seems to be a need for government to subsidise the cost of malaria treatment to very poor households who may be bearing more of the brunt of the cost of malaria. The problem of identification of the poor, administrative bureaucracy and corruption must be dealt with to ensure that the subsidisation reaches those that it is intended for.

8.2 Recommendations

Based on the findings of the study, the following policy recommendations are made so as to reduce or minimise the indirect and direct cost of the disease in the district.

- *Training malaria volunteers*

Assisting households to take more responsibility of the disease, by training malaria volunteers in various communities. Volunteerism, though difficult to implement in practice, seems to be working currently in the district in line with the community health and family planning study. It would be feasible to get volunteers who are well respected from the communities. Volunteers would be expected to visit compounds and households to provide them educate on proper sanitation and waste disposal, malaria causes and symptoms, the need for early treatment and the need to finish full course of treatment to

reduce drug resistance. The volunteers would also be expected to identify and refer malaria cases to clinics and health centres for prompt treatment.

- *Providing a mobile clinic*

Malaria could also be identified and treated early if government in collaboration with private providers could run mobile clinics targeting remote and "difficult to reach areas". Long distance often deters people from seeking early treatment from health facilities and this may lead to severe malaria resulting in higher costs or even death. Long distances may make others seek treatment from drug peddlers, which may lead to more complications, resulting in higher cost. It is hoped that if mobile clinics are effectively in place, the cost of the disease to households would be reduced. However, institutional cost may rise but the rise in institutional cost may have to be compared with the reduction of cost to households in order for them to better understand and appreciate the benefits of the system.

- *Subsidisation*

Government also needs to identify and subsidise the cost of drugs to very poor households as the study found that very poor households (bottom quintile) have to borrow money to pay for malaria care (if they do seek malaria care). The *cash and carry* system may have to be reviewed, and especially its effects on poor households, and their ability to seek health care, especially for malaria. The *cash and carry* system is a term used to describe the user fees implemented in Ghanaian health institutions as part of the health financing reform in the early 1980s, following the sweeping economic recovery

programme of the Government. The system was introduced by pressure from the World Bank and other Donors and it sought among others, to recover 100% of drug cost from users of health services. Though the system provides revenue to health facilities but the fee contribute to low level of utilisation of Government service.

- *Economic empowerment*

Poor households would often have to sacrifice essential goods or borrow money to pay for malaria episodes (if they are to access adequate care). Women bear the brunt of this disease and so setting up income-generating activities targeting women would enable them afford health care, particularly malaria care and other basic essentials for better health. Establishing small pockets of irrigation schemes is one option as irrigation farming has been found to have a positive impact on rural incomes (Akazili 1996). Irrigation dams if poorly constructed may, however, be prime breeding grounds for the mosquitoes that lead to malaria.

- *Public education*

It is recommended that government intensify efforts on public education on the need for early treatment of the disease as well as the use of effective prevention notably the ITNs.

8.3 Further research

For further research in the area, the study recommends the following:

- Firstly, a similar study could be conducted but taking account, the cost of mortality to

households. The study could be conducted over a period of a year. Such a panel study, examining monthly changes in the disease incidence, utilisation of services and value of time would be more sophisticated.

- Secondly, the study looked at the direct and indirect costs suffered by households, but health care providers may also incur significant cost on malaria. Hence it will be recommended that an evaluation of the costs of malaria to the health institutions in the district be conducted. A perspective incorporating both households and health providers would be a more comprehensive evaluation of the economic costs of the disease in the district.

- Finally, the study revealed that malaria patients and their caretakers sought care from various providers. In view of this, an investigation on factors influencing the demand for malaria care is important. This analysis may unearth the factors that might help further explain the health seeking behaviour of malaria patients and caretakers. This information is important since it takes into account all providers, and based on its results, existing programmes for malaria management and control can be improved.

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Appendix 1: Detail estimated results

Table 12: Direct cost by location (rural and urban)

Components of direct cost	RURAL, (n =305households, 443cases)			URBAN, (n =118households, 172cases)		
	Total cost	Total cost per Household**	Total cost per Case*	Total cost	Total cost per Household**	Total cost per Case*
Special food	1414050 ($377.08)	4621.08 ($1.23)	3192 ($0.85)	597310 ($159.28)	5105.21 ($1.36)	3473 ($0.93)
Transport	83000 ($22.13)	271.24 ($0.07)	187 ($0.05)	48400 ($12.91)	413.68 ($0.11)	281 ($0.08)
Drugs	1374600 ($366.56)	4492.16 ($1.20)	3103 ($0.83)	583540 ($155.61)	4987.52 ($1.33)	3393 ($0.90)
Diag./consult	17700 ($4.72)	57.87 ($0.02)	40 ($0.01)	55700 ($14.85)	476.07 ($0.13)	324 ($0.09)
Other	79150 ($21.11)	258.66 ($0.07)	179 ($0.04)	60350 ($16.09)	515.81 ($0.14)	351 ($0.09)
Total	**2968500 ($791.60)**	**9701 ($2.59)**	**6701 ($1.79)**	**1345300 ($358.75)**	**11498 ($3.07)**	**7822 ($2.09)**

Source: Survey Data
Exchange rate: US Dollars $1= ¢3750 cedis (Ghanaian currency) (January 2000 inter bank rate)
Costs in cedis (Ghanaian currency) and US Dollars ($) in brackets
* Mean direct cost per an episode or a case of malaria, 615 malaria cases in 423 households
**Mean direct cost per household, there are 1.45 malaria cases per a household

Table 13: Direct cost by severity (severe and mild)

Components of direct cost	SEVERE, (n =123households, 178 cases)			MILD, (n = 400households, 437cases)		
	Total cost	Total cost per Household**	Total cost per Case*	Total cost	Total cost per Household**	Total cost per Case*
Special food	832410 ($221.98)	6768 ($1.80)	4676 ($1.25)	1178950 ($314.39)	3930 ($1.05)	2698 ($0.72)
Transport	105000 ($28.00)	854 ($0.23)	590 ($0.16)	26400 ($7.04)	88 ($0.02)	60 ($0.02)
Drugs	904390 ($241.17)	7353 ($1.96)	5081 ($1.35)	1053760 ($281.00)	3513 ($0.94)	2411 ($0.64)
Diag./consult	44800 ($11.95)	364 ($0.10)	252 ($0.07)	28600 ($7.63)	95 ($0.03)	65 ($0.02)
Other	103850 (27.69)	844 ($0.23)	583 ($0.16)	35650 ($9.51)	119 ($0.03)	82 ($0.02)
Total	**1990450 ($530.79)**	**16183 ($4.32)**	**11182 ($2.98)**	**2323360 ($619.56)**	**7744 ($2.07)**	**5317 ($1.42)**

Table 10: Indirect cost by location

Elements of indirect cost	RURAL			URBAN		
	Male	Female	C'bined	Male	Female	C'bined
No. of economically active malaria cases and caretakers of age 18-60 years	164	296	460	75	140	215
No.of days lost from productive activities by patients and caretakers of age 18-60yrs	**611**	**1010**	**1621**	**294**	**524**	**818**
Mean days lost from productive activities	**3.2**	**3.0**	**3.1**	**3.0**	**3.1**	**3.0**
No. of malaria cases of age 12 – 17years	11	6	17	7	7	14
Number of days lost by age 12- 17 years	**23**	**25**	**48**	**26**	**27**	**53**
Total waiting time to seek malaria care in minutes and hours in brackets	5758 (96)	5085 (85)	10843 (181)	1719 (29)	3621 (61)	5340 (89)
Mean waiting time in minutes	**28**	**21**	**24**	**25**	**34**	**31**
Prevailing daily wage rate	4500 ($1.20)	4000 ($1.06)	- -	4500 ($1.20)	4000 ($1.06)	- -
Total value of the days lost from productive activities due to malaria*	2749500 $733.2	4040000 $1077.33	6789500 $1810.53	1323000 $352.8	2096000 $558.93	3419000 $911.73
Total value of days lost to prod. activities by malaria patients of age12-17 years**	51750 ($13.8)	50000 ($13.33)	101750 ($27.13)	58500 ($15.6)	54000 ($14.4)	112500 ($30)
Total value of waiting time***	54048 ($14.41)	42500 (11.33)	96548 ($25.75)	16327 ($4.35)	30500 ($8.13)	46827 ($12.49)
Total value of time lost to prod. activities due to malaria(* +** + ***)- indirect cost	2855298 $761.41	4162500 $1110	7017798 $1871.41	1397827 $372.75	2180500 $581.47	3578327 $954.22
Indirect cost per a case of malaria (given that we have 615 malaria cases) [+]	14066 **($3.75)**	17416 **($4.64)**	15842 **($4.22)**	20863 **($5.56)**	20767 **($5.54)**	20804 **($5.55)**
Indirect cost of malaria per household[++]	20396 **($5.44)**	25253 **($6.73)**	22971 **($6.13)**	30251 **($8.07)**	30112 **($8.03)**	30166 **($8.04)**

Source: Survey Data
Exchange rate: US Dollars $1= ¢3750 cedis (Ghanaian currency) (January 2000 inter bank rate)
* Malaria patients and caretakers, amounts in cedis and the equivalent US Dollars ($) in brackets
** Malaria victims of age 12-17 years are assumed to take half of the prevailing wage rate
***Assume 8hrs of work a day, implies ¢563 ($0.15) an hour for men and ¢500 ($0.13) for women
[+] The 615 malaria cases are made of 172 urban (67male, 105female) and 443rural (203male, 239 female)
[++] We have 423 households which implies a mean of 1.45 malaria cases per household

Table 11:Indirect cost by severity

Elements of indirect cost	SEVERE			MILD		
	Male	Female	C'bined	Male	Female	C'bined
No. of economically active malaria cases and caretakers of age 18-60 years	55	170	225	92	358	450
No.of days lost from productive activities by patients and caretakers of age 18-60 yrs	**339**	**1001**	**1340**	**263**	**836**	**1099**
Mean days lost from productive activities	**6.2**	**5.9**	**6.1**	**2.9**	**2.3**	**2.6**
No. of malaria cases of age 12 – 17years	5	5	10	10	11	21
Number of days lost by age 12- 17 years	**26**	**28**	**54**	**23**	**24**	**47**
Total waiting time to seek malaria care in minutes and hours in brackets	2253 (38)	2440 (41)	4693 (78)	5514 (92)	5976 (100)	11490 (192)
Mean waiting time in minutes	**33**	**22**	**26**	**27**	**25**	**26**
Prevailing daily wage rate	4500 ($1.20)	4000 ($1.06)	- -	4500 ($1.20)	4000 ($1.06)	- -
Total value of the days lost from productive activities due to malaria*	1525500 $406.80	4004000 $1067.73	5529500 $1474.53	1183500 $315.6	3344000 $891.73	3462500 $923.33
Total value of days lost to prod. activities by malaria patients of age12-17 years**	58500 ($15.6)	56000 ($14.93)	114500 ($30.53)	51750 ($13.8)	48000 ($12.8)	99750 ($26.6)
Total value of waiting time***	21394 ($5.71)	20500 ($5.47)	41894 ($12.49)	51796 ($13.81)	50000 (13.33)	101796 ($27.15)
Total value of time lost to productive activities due to malaria (* +** + ***)	1605394 $428.11	4080500 $1088.13	5685894 $1516.24	1287046 $343.21	3442000 $917.87	4729046 $1261.08
Indirect cost per a case of malaria (given that we have 615 malaria cases) [+]	23267 **($6.20)**	37436 **($9.98)**	31943 **($8.52)**	6403 **($1.71)**	14585 **($3.89)**	10822 **($2.89)**
Indirect cost of malaria per household[++]	33737 **($9.00)**	54282 **($14.48)**	46317 **($12.35)**	9284 **($2.48)**	21148 **($5.64)**	15692 **($4.19)**

Source: Survey Data
Exchange rate: US Dollars $1= ¢3,750 (Ghanaian currency) (January 2000 inter bank rate)
* Malaria patients and caretakers, amounts in cedis and the equivalent US Dollars ($) in brackets
** Malaria victims of age 12-17 years are assumed to take half of the prevailing wage rate
***Assume 8hrs of work a day, implies ¢563 ($0.15) an hour for men and ¢500 ($0.13) for women
[+] The 615 malaria cases are made of 178 severe (69male, 109female) and 437mild (201male, 236 female)
[++] We have 423 households which implies a mean of 1.45 malaria patients per household

Appendix 2

Form No

HOUSEHOLD SURVEY INSTRUMENT
Economic cost of seeking malaria care to households in the Kassena-Nankana district of northern Ghana

Identification

In the past one-month, have you or any member of your household had malaria?(yes =1, No = 2)	1	2	EXPMAL
NOTE if No = 2, end interview			
Respondent's Name/ID			RESNAM
Respondent (HH Head=1, Adult HH member=2)	1	2	RESPOND
Cpd. name/ID			CPDNNU
Household no.			HHDNUM
Sex	F	M	SEX
Rural/Urban(R=1, U=2)	1	2	RURURB
Date of interview(DD/MM/YY)			DINT
FW's code			FW

SECTION 1: Socio-economic and demographic characteristics of interviewee

1	How old are you (in completed years)?		AGE
2	What is your ethnic background?	Nankam.....1 Kassem.....2 Bulsa.....3 Other(specify)_____4	ETHNIC
3	What is your current marital status?	Married.....1 Never married.....2 Divorced.....3 Widowed.....4 Separated.....5 Other (specify)_____6	MASTCUR
4	What is your educational level?	None.....1 Primary.....2 Secondary.....3 Tertiary.....4	EDUC
5	What is your occupation?	Subsistence farmer.....1 Large scale farmer.....2 Trader/artisan.....3 Civil servant.....4 At school.....5 Too old to work.....6 Other (specify_____.7 DK.....9	OCCUP
6	What is your religion?	Traditional.....1 Christian.....2 Muslim.....3 Other (specify)_____-4	RELIG
7	How many people live in this household? **(eating from the same pot)**		HHSIZE

SECTION 2: Household baseline survey

8. State of housing (Observe)

8.1 Does this household have a modern design (ie zinc roofing excluding animal pound)?	Yes..... ..1 No..... ..2	MODESIGN

9.Household durable (goods & assets)

Does any member of your household own the following items (functioning)? **(Code 00 if N)**

Item	Y/N	Number if Y	
9.1 Motor vehicle(cars, tractor, motor bike)			MOTVEH
9.2 Bicycles			BICYCLE
9.3 Electric stove			ELSTOVE
9.4 Gas stove			GASTOVE
9.5 Fridge			FRIDGE
9.6 TV			TV
9.7 Sewing machine			SEWMACH
9.8 Beds			BED
9.9 Coalpots/kerosene stoves			CKELAMP
9.10 Electric lamps			ELAMP
9.11 Traditional lamp			TRALAMP
9.12 Kerosene lamp			KERLAMP
9.13 What utensils are commonly used in this household?		Earth bowls..... ..... . 1 Aluminum pans.....2 Other (specify)_____3 DK.....9	UTENSILS
9.14 What is the common toilet facility used by this household?		Free range.....1 Pit latrine.....2 KVIP.....3 W.C.....4 Other (specify)_____5 DK.....9	TOILET
9.15 What is the common source of drinking water for this household?		Pipe borne water .....1 Bore-hole.....2 Well water.....3 Dam/dugout.....4 Stream.....5 Other(specify)_____.6	WATER

SECTION 3a: Indirect and direct cost of malaria treatment

10	How many of your household members (including respondent) have had a malaria episode within the past one-month?	☐☐	NUMEM
11	Is paa/pua/fever/malaria a common illness in this area?	Yes……..1 No……2	COMILL

INSTRUCTION: IF MORE THAN FOUR MEMBERS IN 11, LIST THE FOUR MOST RECENT CASES IN 13……LISTMEM

Q.	NO	Name(in capitals)	R'ship to Resp. Refer to **	Sex (M/F)	Age	Occupation Refer to ***
12a	Person 1					
12b	Person 2					
12c	Person 3					
12d	Person 4					

** Relative……1; husband….2; wife….3; Friends…4; Other(specify)…5; NA…..8; DK….9

*** Subsistence farmer…1; large scale farmer..2; Trader/artisan....3; Civil servant..4;At school.5; Too old to work..6; Too young to work….7; Other (specify)….8; DK…9

NOTE: FW MUST READ INSTRUCTION CAREFULLY:

- IN THIS SECTION FW SHOULD ASK ALL QUESTIONS OF RELEVANCE TO EACH MEMBER BEFORE PROCEEDING ONTO THE NEXT MEMBER (ie WORK 'VERTICALLY' AND NOT 'HORIZONTALLY'

NOW I WOULD LIKE TO ASK YOU ABOUT THE MEMBERS OF YOUR HOUSEHOLD WHO HAD MALARIA IN THE PAST MONTH (FOUR WEEKS).

	Person 1	Person 2	Person 3	Person 4
	Name:……	**Name:……**	**Name:……**	**Name:……**
How long did member experience the malaria? **(enter NK if respondent does not know and NA for not applicable)**	**13a.** ☐☐days	**13b.** ☐☐days	**13c.** ☐☐ days	**13d.** ☐☐ days
What was the state of member's malaria episode?	**14a** Severe……1 Mild……2 Other(specify) _____3 NA……8 DK……9	**14b** Severe……1 Mild……2 Other(specify) _____3 NA……8 DK……9	**14c** Severe……1 Mild……2 Other(specify) _____.3 NA……8 DK……9	**14d** Severe……1 Mild……2 Other(specify) _____3 NA……8 DK……9
Did member do anything to treat the malaria?**(if No(2) skip to Q.20)**	**15a** Yes……1 No……2 NA……8 DK……9	**15b** Yes……1 No……2 NA……8 DK……9	**15c** Yes……1 No……2 NA……8 DK……9	**15d** Yes……1 No……2 NA……8 DK……9

If **Yes in 15**, what did member do to treat the malaria?	**16a** Sought modern health care only.....1 Trad/herb health care only.....2 Trad/herb/Modern health care.....3 NA.....8 DK.....9	**16b** Sought modern health care only.....1 Trad/herb health care only.....2 Trad/herb/Modern health care.....3 NA.....8 DK.....9	**16c** Sought modern health care only.....1 Trad/herb health care only.....2 Trad/herb/Modern health care.....3 NA.....8 DK.....9	**16d** Sought modern health care only..1 Trad/herb health care only.....2 Trad/herb/Modern health care.....3 NA.....8 DK.....9
If **1 or 3 in 16**, what type of Modern health care was sought? **(Circle all that applies)**	**17a** Hospital .....1 HC/clinic.....2 Village H. worker .3 Chemist .....4 Drug peddler .....5 Self-treatment. .....6 NA.....8 DK.....9	**17b** Hospital .....1 HC/clinic.....2 Village H. worker .3 Chemist .....4 Drug peddler .....5 Self-treatment. .....6 NA.....8 DK.....9	**17c** Hospital .....1 HC/clinic.....2 Village H. worker .3 Chemist .....4 Drug peddler .....5 Self-treatment. .....6 NA.....8 DK.....9	**17d** Hospital .....1 HC/clinic.....2 Village H. Worker3 Chemist .....4 Drug peddler .....5 Self-treatment. ....6 NA.....8 DK.....9
If **1 to 6 in 17**, where did member seek the malaria treatment?	**18a** Nav. Hosp.....1 Town clinic.....2 Village HC/clinic ....3 Different village HC/clinic_____ 4 Village market.....5 Different village market_____ 6 Other (specify) _____7 NA.....8 DK.....9	**18b** Nav. Hosp.....1 Town clinic.....2 Village HC/clinic ....3 Different village HC/clinic_____ 4 Village market.....5 Different village market_____ 6 Other (specify) _____7 NA.....8 DK.....9	**18c** Nav. Hosp.....1 Town clinic.....2 Village HC/clinic ....3 Different village HC/clinic_____ 4 Village market.....5 Different village market_____ 6 Other (specify) _____7 NA.....8 DK.....9	**18d** Nav. Hosp.....1 Town clinic.....2 Village HC/clinic.3 Different village HC/clinic_____ 4 Village market.....5 Different village market_____ 6 Other (specify) _____7 NA.....8 DK.....9
If member went to the hospital/health centre/clinic/chemist/Trad/herbalist, by what means did member seek health care?	**19a** On foot.....1 Donkey-cart.....2 Bicycle.....3 Motorbike.....4 Vehicle.....5 Other (specify) _____6 NA.....8 DK.....9	**19b.** On foot.....1 Donkey-cart.....2 Bicycle.....3 Motorbike.....4 Vehicle.....5 Other(specify) _____6 NA.....8 DK.....9	**19c.** On foot.....1 Donke-cart.....2 Bicycle.....3 Motorbike.....4 Vehicle.....5 Other(specify) _____6 NA.....8 DK.....9	**19d.** On foot.....1 Donkey-cart.....2 Bicycle.....3 Motorbike.....4 Vehicle.....5 Other(specify) _____6 NA.....8 DK.....9
If **No in 15**, why was nothing done to treat the malaria? **(After coding answer in Q.20, skip to section 4)**	**20a** No money.....1 Expensive.....2 Not severe.....3 Other(specify _____4 NA.....8 DK.....9	**20b** No money.....1 Expensive.....2 Not severe.....3 Other(specify _____4 NA.....8 DK.....9	**20c** No money.....1 Expensive.....2 Not severe.....3 Other(specify _____4 NA.....8 DK.....9	**20d** No money.....1 Expensive.....2 Not severe.....3 Other (specify) _____4 NA.....8 DK.....9

If **1 or 3 in 17**, how long did member have to wait before seeing the health worker? **(Probe and estimate the time in hours and mins)**	**21a** ☐☐ ☐☐ hours mins	**21b** ☐☐ ☐☐ hours mins	**21c** ☐☐ ☐☐ hours mins	**21d** ☐☐ ☐☐ hours mins
Was member able to go about his/her normal duties (day to day activities) during the malaria episode? **(if Yes fully in Q.22, skip to Q.25)**	**22a.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9	**22b.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9	**27c** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9	**27d.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9
If **Yes Partially (2) or Not at all (3)**, how long was member unable to do his/her normal duties?	**23a** ☐☐ days	**23b** ☐☐ days	**23c** ☐☐ days	**23d** ☐☐ days
If member were a working adult (able to sell his/her labour), how much would he/she have earned in a day if he/she had not been ill with a malaria episode?	**24a.** ¢_____ **if non working adult enter NA for 24a**	**24b.** ¢_____ **if non working adult enter NA for 24b**	**24c.** ¢_____ **if non working adult enter NA for 24c**	**24d.** ¢_____ **if non working adult enter NA for 24d**
If member is currently attending school, how long was he/she unable to attend school because of the malaria episode?	**25a** ☐☐ days **not attending school enter NA in 25a**	**25b** ☐☐ days **not attending school enter NA in 25b**	**25c** ☐☐ days **not attending school enter NA in 25c**	**25d** ☐☐ days **not attending school enter NA in 25d**

INSTRUCTION: QUESTIONS **26a** to **26d** ARE ARRANGED VERTICALLY BELOW PLEASE CAREFULLY ESTABLISH COST OF EACH SERVICE TO INDIVIDUAL MEMBER WHO HAVE SOUGHT CARE FOR THEIR MALARIA EPISODE

26. In seeking health care (ie from Hosp/HC/clinic, Village H. worker, chemist, Trad/herb and selftreatment) of member during the malaria episode, how much do you think was spent on the following to treat the malaria? **(Obtain individuals cost and add up to get the total cost)**

	person	***special foods***	***Transportation (in and out)***	***Cost of drugs***	***Diagnostic Consultation fee***	***Other expend. (Specify & value)***	**Total expend-iture**	
26a	1	¢	¢	¢	¢	¢	¢	TOEXP26A
26b	2	¢	¢	¢	¢	¢	¢	TOEXP26B
26c	3	¢	¢	¢	¢	¢	¢	TOEXP26C
26d	4	¢	¢	¢	¢	¢	¢	TOEXP26D
total expenditure		¢	¢	¢	¢	¢	¢	GRTOEXP
		TEXPFOOD	TEXPTRAN	TEXPDRUG	TEXPDCON	TEXPOTH	GRTOEXP	

SECTION 3b: Caretaker

Note: A member may have more than one caretaker, we are interested in the main care taker

	Person 1	Person 2	Person 3	Person 4
Did member have a Caretaker (especially relevant to children) during his/her malaria episode?	**27a** Yes .....1 No.....2 NA.....8 DK.....9 **(If 2 or 9 go to 27b)**	**27b** Yes .....1 No.....2 NA.....8 DK.....9 **(If 2 or 9 go to 27c)**	**27c** Yes .....1 No.....2 NA.....8 DK.....9 **(If 2 or 9 go to 27d)**	**27d** Yes .....1 No.....2 NA.....8 DK.....9 **(If 2 or 9 go to sect.4)**
What is Caretaker relationship to the member who had the malaria episode?	**28a** Husband/wife.....1 Mother/father.....2 Son/daughter.....3 Other relatives....4 Friends.....5 NA.....8 DK.....9	**28b** Husband/wife.....1 Mother/father.....2 Son/daughter.....3 Other relatives.....4 Friends.....5 NA.....8 DK.....9	**28c** Husband/wife.....1 Mother/father.....2 Son/daughter.....3 Other relatives....4 Friends.....5 NA.....8 DK.....9	**28d** Husband/wife.....1 Mother/father.....2 Son/daughter.....3 Other relatives.....4 Friends.....5 NA.....8 DK.....9
Sex of Caretaker?	**29a.** Male.....1 Female.....2 NA.....8	**29b** Male.....1 Female.....2 NA.....8	**29c.** Male.....1 Female.....2 NA.....8	**29d.** Male.....1 Female.....2 NA.....8
Age of Caretaker (in completed years)?	**30a.** ☐☐ Years	**30b.** ☐☐ Years	**30c.** ☐☐ Years	**30d.** ☐☐ Years
Occupation of Caretaker?**(If code 6 don't ask 34)**	**31a.** Subsistence farmer.1 Large scale farmer.2 Trader/artisan... ..3 Civil servant .....4 At school..... ....5 Not working.....6 Other (specify) _____7 NA.....8 DK.....9	**31b.** Subsistence farmer...1 Large scale farmer...2 Trader/artisan.....3 Civil servant.....4 At school.....5 Not working.....6 Other (specify) _____7 NA.....8 DK.....9	**31c.** Subsistence farmer...1 Large scale farmer...2 Trader/artisan.....3 Civil servant.....4 At school.....5 Not working.....6 Other (specify) _____7 NA.....8 DK.....9	31d. Subsistence farmer...1 Large scale farmer...2 Trader/artisan.....3 Civil servant.....4 At school.....5 Not working.....6 Other (specify) _____7 NA.....8 DK.....9
Was Caretaker able to do his/her normal duties at the time of taking care of member who had malaria? **(If yes fully, skip to section 4)**	**32a.** Yes fully.....1 Yes partially.....2 Not at all..... .3 NA.....8 DK.....9	**32b.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9	**32c.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9	**32d.** Yes fully.....1 Yes partially.....2 Not at all.....3 NA.....8 DK.....9
If **Yes partially (2) or Not at all (3)** how long was caretaker unable to go about his/her normal duties?	**33a** ☐☐ days	**33b** ☐☐ days	**33c** ☐☐ days	**33d** ☐☐ days
How much would the Caretaker (if working) have earned for a day if he/she were not taking care of the member?	**34a.** ¢_____	**34b.** ¢_____	**34c.** ¢_____	**34d.** ¢_____

SECTION 4: Household expenditure/debt

35.In the last month, did the household spend money on the following items? **(If N enter 00)**

Item	Y/N	Amount if Y	Code
35.1 Clothing and shoes: for both adults and children			CLSHOE
35.2 Health care: clinics/HC/hospitals fees, buying drugs from private/market dispensaries, traditional/herbal treatment fees(**Other health care expenditure)**			HLTHCARE
35.3 Education: children school fees, books and other materials, P.T.A and other school contributions			EDCATION
35.4 Foods: including millet, corn, beans groundnuts, salt, pepper, etc.			FOODHOU
35.5 Utility services: water, electricity			UTILITIES
35.5 Capital goods: radio, bicycles, motors, vehicles, building etc			CAPGOOD
35.6 Rent			RENT
35.7 Direct taxes			TAX
35.8 Drinks/colanuts/tobacco/funeral celebration, marriages			DRCOTOF
35.9 Others(specify)			OTHERH
35.10 Total expenditure			TOTEXP

Household debt

36	Does any member of this household owe cash or goods to any institution or to any individual who is not a H/H member? **(If No or DK in Q.36, enter NA in Q.37)**	Yes.....1 No.....2 DK.....3	DEBT
37	If Yes (1) in question 36, how much (¢)? **(probe to establish amount)**	¢_____	MUCHDEBT

AFTER THE INTERVIEW:

⇒ ***Check your form to ensure you have not left blanks or inconsistencies***

⇒ ***Thank the respondent for his/her cooperation and time***

Form checked and certified by: FS's Code ☐☐ Date ☐☐☐☐☐☐....FS

Appendix 3

CONSENT FORM

STATEMENT OF INFORMATION FOR WOMEN AND MEN PARTICIPATING IN THE ECONOMIC COST OF MALARIA SURVEY, January 2000

Purpose: The Ministry of Health through the Navrongo Health Research Centre and the University of Cape Town is undertaking this study with the aim of understanding the burden of malaria among both women and men in this community. In this study malaria health issues will be discussed with household heads or men and women standing in for the household head, individually. Information obtained from this study will be used by policy makers to design appropriate policies and to develop health services activities to improve the management of malaria and productivity of individuals

Procedures: You are being asked to participate in an interview, which will take about one hour. I will be asking you questions related to the management of malaria at home and at the hospital and other information that will help to provide more information on malaria. There are no correct answers to these questions. You are free to answer or not.

Risks and discomforts: The risks to you of participation in this study are minimal. However, some of the issues that may be discussed are of a personal and sensitive nature (household property). If at any time you do not want to answer questions you are not obliged to do so.

Benefits: Your participation in this study will not benefit you directly, but it may benefit other people in your community in the future. After the interview we can discuss any questions you may have related to the issues discussed.

Confidentiality: We do not intend to ask you about your own private matters, and you should not feel under any obligation to answer all these questions. On the other hand if you do wish to share your personal experiences the research team will ensure absolute confidentiality. Your name will not be mentioned on any written document. Nobody will be able to trace anything we discuss back to you.

Right to refuse or withdraw: Before being interviewed or participating in the study, please understand that your participation is voluntary. You do not need to answer questions or to participate in the research if you do not want to. You can stop participating in this study at any time.

Do you have any questions?
Do you agree to participate in the study?

If at any time following this interview you have any questions or would like to speak to someone involved in this study, please feel free to contact Dr. Alex Nazzar, Director of the Navrongo Health Research Centre.

Thank you.